# INDEPENDENT COST REVIEW (ICR)

# and

# INDEPENDENT COST ESTIMATE (ICE)

# STANDARD OPERATING PROCEDURES (SOP)

# Revision 2

## DEPARTMENT OF ENERGY (DOE)

## OFFICE OF PROJECT

## MANAGEMENT OVERSIGHT AND ASSESSMENTS (PM)

**February 10, 2016**

***SUMMARY OF UPDATES: This revision includes the following significant changes since the December 2013 SOP release:***

1. *The original SOP discussed how an EIR and an ICE could be executed in tandem, but since we are no longer advocating this approach the ICE process has been completely separated from the EIR process and references to EIRs have been removed.*
2. *Section 1 adds a reference to Public Law 2055 reflecting that we must now, as a matter of law, perform an ICE at CD-3 for projects with a TPC over $100 million.*
3. *Section 2 notes that DOE Programs must now pay for ICRs and ICEs and reflects that PARS II must be used to project ICR and ICE requirements.*
4. *Section 3.2 expands the criteria for ICR/ICE Team Selection.*
5. *The process flow sheets for ICRs and ICEs have been simplified and replaced with the following:*
6. *Summary timelines in Section 4.2 (ICR Schedule) and Section 5.3 (ICE Schedule).*
7. *Appendix B-- ICR Schedule (GANTT Chart), and Appendix E-- ICE Schedule (GANTT Chart)*
8. *Section 4.3 (ICR Activities and Deliverables) and 5.4 (ICE Activities and Deliverables)*
9. *Section 4.1.2 (ICR at CD-1) contains a more in-depth discussion of Life Cycle Cost Estimate (LCCE) and Benefit-Cost Analysis requirements.*
10. *Section 5.4.6 (Reconciliation) includes considerably more guidance than the original version.*
11. *Section 7 (Lessons Learned) has been added*
12. *The Definitions section has been removed and the Acronyms list has been shortened.*
13. *Section 5 clarification that addresses mitigating actions of potential estimate bias by providing clarification of expectations for the determination of Project Team detailed information that will be supplied unabridged.*
14. *Updates to organizational details (OAPM to PM) and alignment with S-1 memorandums (2015) on project management.*

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## 1. PURPOSE AND AUTHORITY

This Standard Operating Procedures (SOP) document provides guidance for Department of Energy (DOE) Project Management Oversight and Assessment (PM) staff and contractors performing either an Independent Cost Estimate (ICE) or an Independent Cost Review (ICR) for a capital asset project. The approval process for DOE capital asset projects includes five sequential approval steps, each of which is referred to as a Critical Decision (CD):

- CD-0, *Approve Mission Need*. There is a need that cannot be met through other than material means.
- CD-1, *Approve Alternative Selection and Cost Range*. The selected alternative and approach is the optimum solution.
- CD-2, *Approve Performance Baseline*. Definitive scope, schedule and cost baselines have been developed.
- CD-3, *Approve Start of Construction/Execution*. The project is ready for implementation.
- CD-4, *Approve Start of Operations or Project Completion*. The project is ready for turnover or transition to operations, if applicable.

Each non-major system project CD is approved by the Project Management Executive (PME) for a particular project. For larger projects, including all Major System Projects[1], the Chief Executive for Project Management (CE) is the approval authority. DOE Order 413.3B, *Project Management for the Acquisition of Capital Assets*, identifies supporting information that must be provided to an CE/PME prior to each CD. Some type of cost estimate is required for each critical decision except CD-4, at which point a summary of actual costs is provided. In addition to the cost estimate that is developed by the Project Team, a second estimate is also required for projects over $100M. The second estimate must be developed independently of the Project Team and project sponsor, in order to avoid conflicts of interest.

Public Law 2055, enacted December 23, 2011, ***specifically requires that independent cost estimates be prepared prior to CD-2 and CD-3 for projects with a Total Project Cost (TPC) over $100 million.*** PM performs these ICEs. The wording in Public Law 2055 reads as follows:

> *SEC. 310. None of the funds made available in this title may be used to approve critical decision-2 or critical decision-3 under Department of Energy Order 413.3B, or any successive departmental guidance, for construction projects where the total project cost exceeds $100,000,000, until a separate independent cost estimate has been developed for the project for that critical decision.*

In addition to ICEs that are required by law, PM also performs the following cost evaluations pursuant to DOE O 413.3B requirements:

[1] A Major System Project is a capital asset project with a Total Project Cost of over $750 million.

- Either an ICE or an ICR prior to CD-1 approval for all projects with a TPC over $100 million.
- An ICR prior to CD-0 for all Major System Projects, and for any other projects as designated by the CE/PME

DOE O 413.3B also requires that a Project Management Support Office (PMSO) conduct an Independent Project Review (IPR) prior to CD-2 to validate the proposed Performance Baseline for projects with a TPC less than $100 million. For DOE Programs that do not have a PMSO, PM conducts the IPR. In such instances, either an ICR or an ICE would typically be conducted in conjunction with the IPR.

Finally, when a significant baseline deviation occurs during the execution of a project, the CE must make a specific determination whether to terminate the project or establish a new performance baseline by requesting the Federal Project Director (FPD) to submit a Baseline Change Proposal (BCP). Pursuant to DOE O 413.3B, PM must validate new performance baselines that are established because of a deviation for projects with a TPC greater than or equal to $100M. PM typically performs an ICE in such instances.

Appendix A outlines a process for determining whether to perform an ICE or an ICR using various criteria including the phase of a project, its total project cost (TPC), and risk considerations.

## 2. BUDGETING

PM plans and implements all approved PM cost reviews and estimates, including arranging for and managing the services of contactors when required. However, the funds to pay for ICRs and ICEs are provided by the DOE Program Office that sponsors a particular project. PM does not request funds to perform ICEs and ICRs within its budget. It is, consequently, very important that Federal Project Directors (FPDs) and sponsoring DOE Program Offices budget adequate funds to pay for ICEs and ICRs. It is also critical that they provide PM with sufficient advance notice of when an ICE or ICR must be performed. This is best done using the Project Assessment and Reporting System (PARS II) as well as notification to the respective PM project analyst.

PM uses PARS II to track projects continuously after CD-0 is approved. PARS II identifies planned dates for future critical decisions, and PM analysts use this information to determine when a project will require an ICE or an ICR. DOE O 413.3B requires Program Offices to provide monthly narrative project assessments in PARS II, and PM also enters a monthly written narrative to reflect the status of each active project. By ensuring that all project information in PARS II is accurate (particularly planned dates for CD-1, CD-2 and CD-3), FPDs and sponsoring DOE Program Offices provide PM with the information it needs to properly plan for ICEs and ICRs.

Generally, in order to initiate an ICE or ICR, a Project Management Support Office (PMSO) or Program Manager (if no PMSO exists) should submit a request (e.g., e-mail or phone call) to PM ideally 12 weeks prior, but no less than 8 weeks prior to the desired start of the ICE or ICR on-site visit. This time frame will be tailored as appropriate, including expanding the time for large, complex or unique projects. This advance notice is required to ensure that an appropriate review/estimate scope is developed (tailored) for the project, and that all necessary resources (including funding and personnel with appropriate subject matter expertise) are available. Of equal importance, Programs should ensure that they are prepared to provide the substantial documentation that is required to support an ICR or ICE, as reviewed prior to the start of an ICE/ICR in a sufficiency review. Insufficient documentation is a major contributor to both schedule delays and less than optimum ICR/ICE results. Appendix C identifies documents that are needed for an ICR, and Appendix F identifies documents that are needed for an ICE.

# 3. ROLES, RESPONSBILITIES, AND TEAM COMPOSITION

## 3.1 ICE/ICR Roles and Responsibilities

Table 1 identifies key players in an ICE/ICR and their typical responsibilities.

**Table 1 – Roles and Responsibilities**

| Role | Responsibility |
|---|---|
| PM Lead | Federal lead; conduct scoping meeting; prepare statement of work for contractor support and evaluate contractor proposals; facilitate the process and resolve issues; kick-off onsite entrance and exit briefs; prepare draft review or estimate plan and approve final plan; provide input to and review/approve review/estimate report |
| Program/Project/FPD | Support review process with resources, time, data, and personnel; review report for factual accuracy; ensure that funds are available to perform ICRs and ICEs |
| ICR or ICE Contractor Team Lead | Leads Contractor team members and serves as Contractor POC |
| ICR or ICE Contractor (other active review participants) | ICR/ICE team members perform assigned reviews, provide input to draft report; support Corrective Action Plan comment resolution (if applicable), recommend validation |
| ICR or ICE Peer Members (from DOE Program office) | ICR/ICR team members, provide input to Review/Estimate Plan, perform assigned reviews, and provide input to out briefing, and draft report. Provide continuity and future follow-up during DOE Program office peer reviews. |

All ICE/ICR Team documents, including the review/estimate plan, entrance and exit briefs, and the report are to be written as, viewed as, and communicated as PM products. The name(s) of any PM support contractor(s) selected to support an ICE/ICR should be appropriately identified in the documentation (e.g., Executive Summary and team biographical sketches). The planning and report document covers should identify only PM, and should contain the DOE logo.

## 3.2 ICR/ICE Team Selection Criteria

PM should initially conduct a “Feds-only” scoping meeting with Program Office and Project Team representatives to collaboratively define the scope, bounds, and objectives of a cost review. The PM Lead should chair the scoping meeting. Section 4.3.1(ICR) and Section 5.4.1 (ICE) of this SOP provide details on conducting a scoping meeting. A sample format (Scoping Meeting Template Form) for documenting the agreed-upon scope of the ICR or ICE is provided on the PM website (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations). The scoping meeting attendees should discuss the subject matter expertise and skills required of the ICR/ICE Team members.

The PM Lead should subsequently prepare a Purpose Statement for the ICE or ICR, which helps to determine team needs and select team members.

ICE/ICR Teams should include individuals with appropriate experience – *as applicable* - in project management, scheduling, cost estimating/cost engineering, risk management, as well as subject matter experts (SMEs) with knowledge of specific areas required to understand and analyze a particular project (e.g., any unique technical areas such as nuclear safety expertise, Hazard Category 1, 2, and 3 nuclear facilities or project execution strategies). Not every ICE or ICR Team needs to include all conceivable professional disciplines. The team size and composition depend on the complexity and scope of the review/estimate, the project's risk and performance profiles, the schedule for completion, and the ICR/ICE budget. The PM Lead should ensure that all necessary review areas or estimate areas are covered by qualified team members.

PM staff will often be assisted by representatives of other DOE offices. To preserve the independent nature of the ICR or ICE, it is inappropriate for the project advocates (i.e., the DOE site office line management, the DOE program manager, or the DOE site project contractor) to participate as a member of an ICR or ICE team. If the DOE Program Office staff desires to provide team members, none of the assigned staff members should be a project advocate. A Program Office project advocate may, however, participate as an Observer. All review/estimate team members are expected to provide independent input to the out-brief and to the review/estimate report while adhering to the schedule approved by PM in the review/estimate plan.

While PM performs some ICRs in support of CD-0 or CD-1 using only its own staff, contractor support is typically used to assist PM in conducting reviews and estimates. The PM website contains Statement of Work Templates for obtaining contractor support for ICRs and ICEs: (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations).

The PM Lead should prepare the statement of work for contractor support and evaluate any resulting contractor proposals. The support contractor will assist the PM Lead in developing the review/estimate Plan, assigning areas of responsibility to team members, executing the review/estimate, developing the out-brief, and drafting the review/estimate Report.

PM will approve the final review/estimate team membership via its approval of the review/estimate plan.

In practice, the makeup of ICE/ICR teams varies dependent upon project and its phase. Some of the following questions have a significant bearing on team composition and size.

1. What is the purpose of the estimate? The DOE *Cost Estimating Guide* indicates that the purpose of an estimate should be stated in precise, unambiguous terms. The *purpose statement* should indicate why the estimate is being prepared, how it will be used, who will receive it, what its overall scope is. One "take-away" from the scoping meeting should be a clear understanding and agreement concerning the purpose of the estimate. It should be considered a "best practice" to document the results of the scoping meeting with a written purpose statement.
2. What level of estimating/evaluation detail is needed? The types of estimating and related expertise that will be needed are, to a large extent, driven by required level of detail in the estimate or review. For example, the purpose for an ICE or ICR performed prior to CD-1, *Approve Alternative Selection and Cost Range*, is to verify the reasonableness of a "cost range" associated with an approved alternative. Similarly, an ICR prior to CD-0, *Approve*

*Mission Need*, is performed to examine the reasonableness of a Rough Order of Magnitude (ROM) cost estimate. Highly detailed, "bottom-up" cost estimating is neither necessary nor appropriate in either of these instances, and consequently a comparatively small number of estimators with experience preparing conceptual estimates should suffice. For an ICR at CD-0, an ICR Team might consist entirely of PM staff members with experience on projects of a similar magnitude and complexity. On the other hand, if an ICE Team must develop a "bottom-up" estimate at CD-2 or CD-3 for a complex project with complete design and construction documents, then cost estimators with experience preparing detailed estimates across a comparatively wide range of engineering/construction disciplines will be required, as well as cost and schedule risk analysts.

3. Will formal reconciliation be required? If so, must the entire ICE Team be involved in the reconciliation process, or only a select few?

4. Are there appropriate ICR/ICE team member to be able to address the Life Cycle Cost Estimate (LCCE) being reviewed in addition to a construction estimate? Reviewing a life cycle cost estimate for a complex project may require different skills and experience than reviewing a construction cost estimate.

5. Who will have primary responsibility for report preparation, logistics, etc.? PM may be able to manage the entire effort, including report preparation and logistics, on comparatively straightforward ICRs for which no contractor support is required. However, for more complex ICRs and for all ICEs, it is prudent to ensure that the team includes a contractor Team Lead to perform these functions.

6. Have other project reviews already been performed? This is particularly important for an ICR, which examines the reasonableness of a project team's cost estimate, including its quality, assumptions, and risks. In order to determine whether a cost estimate is well-documented, comprehensive, accurate and credible, an ICR team must examine not only the estimate itself, but also the project scope, schedule, acquisition strategy, management approach, funding profile, and project risks. If these "non-estimate" items have already been reviewed – e.g., through one or more Independent Project Reviews – and the reports of those reviews are available, then the ICR Team may be able to rely largely on those sources. If not, then the ICR Team may have to pursue more lines of inquiry than might otherwise be expected during a "normal" cost review, which may in turn require additional SME support.

7. Does the project have a high risk profile? Careful consideration should always be given to the qualifications of risk analysts on an ICE/ICR Team to ensure that they have sufficient experience on the particular type of work for which the estimate or review is being performed. However, this is especially true of a project with a high risk profile. The Acquisition Strategy can have a significant bearing on the risk profile: a project that will be wholly or largely executed through a firm fixed price, competitive bid has a substantially different risk profile than does a project that will be largely self-performed by an M&O Contractor.

8. Is an Independent Government Cost Estimate (IGCE) also being prepared? An IGCE is the government's estimate of the resources and projected costs that a contractor will incur in the performance of a contract. The scope of an IGCE needs to be restricted to the contract scope and conditions, and consequently an IGCE does not always address the

full project scope of a capital asset project. However, it may be both reasonable and cost-effective to perform an IGCE and an ICE simultaneously, using the same estimating team. When this is done, the IGCE Report should be issued as a separate, stand-alone deliverable that will be used primarily by the Contracting Officer for the project.

# 4. CONDUCTING AN INDEPENDENT COST REVIEW

An ICR is an independent evaluation of a Project Team's cost estimate that examines the reasonableness of the estimate quality, assumptions, and risks.

An ICR Team reviews all available project documentation; receives briefings from and holds discussions with the Project Team; completes sufficient analysis to assess the reasonableness of project assumptions supporting the cost and schedule estimates; assesses the rationale for the methodology used in preparing the estimate; and checks the completeness of the estimate, including appropriate allowances for risks and uncertainties. The result of the ICR is a report that details the findings and recommendations.

The following sections provide details on developing a schedule for an ICR, determining technical requirements for ICRs at various different phases of a project, and preparing an ICR report.

For all ICRs, the ICR Team should evaluate the project cost estimate against GAO's Twelve Steps of a High-Quality Cost Estimating Process. This evaluation should be documented within an Appendix of the report. In addition, a self-evaluation should be submitted of the IPT's evaluation against the same GAO process aforementioned, also contained within an Appendix of the report.

## 4.1 ICR Requirements at each Critical Decision

The underlying purpose of an ICR and the manner in which it will be will be used depend primarily on the stage of project development at which it is performed.

### 4.1.1 ICR at CD-0

The purpose of an ICR prior to CD-0, *Approve Mission Need*, is to evaluate the reasonableness of the project's initial Rough Order-of-Magnitude (ROM) cost range based on the statement of mission need. The primary use of the CD-0 initial ROM range estimate is to provide decision-makers a frame of reference relative to potential future resource requirements. *Affordability is an implied consideration at this stage: it makes little sense for a Program Office to pursue an initiative that it cannot reasonably afford to execute*. The ROM cost range also indicates the organizational level at which the PME will likely be located. Although there is no definitive requirement that the PME be based on the high end of the ROM cost range, such a practice makes sense, and PM should question a decision to proceed otherwise. It is very important that the ROM cost range be realistic, because any substantial understatement could send false signals regarding both affordability and the proper level of acquisition oversight.

Functional requirements that must be met should be defined at this stage. (See DOE Order 413.3B, Appendix A, section 4.a (page A-4) and DOE Guide 413.3-17). To develop the ROM

cost range, a list of possible solutions is needed, with enough definition to allow some level of cost estimating. However, these possible solutions are not intended to restrict the investigation of alternatives conducted during the conceptual design and alternative selection phase of the project. At CD-0, a proposed project may not yet be associated with any particular geographic location, and it is generally premature to have selected a design concept or to have developed a detailed physical definition of any particular alternative.

A CD-0 ROM cost range should not be construed as representing a preliminary cost and schedule estimate for a particular capital asset project, because no specific capital asset alternative has yet been selected. Similarly, ROM cost range estimates should not be considered budget-quality, since they are likely to change as more detailed project requirements and design concepts evolve during the conceptual design stage. Therefore, no subsequent evaluation of project performance (i.e., success of failure) should be made relative to the initial ROM cost range estimates.

An ICR at CD-0 should carefully evaluate both the functional requirements and the range of possible solutions, since the functional requirements and range of possible solutions may be the only basis for the estimate. To perform this review, SMEs with experience in similar programs and functions may be needed.

### 4.1.2 ICR at CD-1

An ICR prior to CD-1, *Approve Alternative Selection and Cost Range*, should review the cost estimates for all of the various alternatives that were considered. If serious concerns arise over the technical adequacy of the recommended alternative or the reasonableness of its estimated cost or schedule, then the CE making the CD-1 alternative selection should also be apprised of the costs, benefits and technical adequacy of other alternatives. The estimated costs of those alternatives should be as credible as those for the recommended alternative.

In some instances, PM may perform either an ICR or an ICE at CD-1. In most instances, an ICR will be performed at CD-1, but an ICE may be warranted if the ICR Team determines that there is significant uncertainty as to the quality of the range estimate or the ability of the project/program team to develop a reasonable estimate. *Appendix A outlines a process for determining whether an ICR or ICE should be performed.*

In preparation for CD-1, the Project Team should have developed a conceptual design report and an estimate of the design and construction costs and schedules for various alternatives. A life-cycle cost estimate (LCCE) is also required for all alternatives under consideration. The LCC Handbook as well as DOE Guide 413.3-21 provides further information on preparing a LCCE as well as life cycle cost analysis (LCCA).

The Secretary's updated policy (Secretarial memorandums released December 1, 2014 as well as June 8, 2015) require that for all projects with a Total Estimated Cost (TEC) greater than the current General Plant Project (GPP) threshold, the responsible program office shall conduct prior to Critical Decision 1, an AoA, which includes LCCE and LCCA that is independent of the contractor organization responsible for managing the construction or constructing the proposed capital asset project. The PME may also require an independent AoA be conducted if a performance baseline deviation occurs or if new technologies or solutions become available. For

projects with an estimated total project cost less than $50 million (i.e., representing the upper end of the cost range), the AoA shall be commensurate with the project cost and complexity. In addition, the policy requires that AoAs be conducted consistent with best practices identified by the GAO in their report GAO-16-22, Amphibious Combat Vehicle, Some Acquisition Activities Demonstrate Best Practices; Attainment of Amphibious Capability to be Determined (October 2015), and that they "integrate NEPA into project planning to ensure planning and decisions reflect environmental considerations, avoid delays later in the process, and anticipate and attempt to resolve any potential issues rather than be an after the fact process that justifies a decision already made". An ICR Team should ensure that a CD-1 documentation package contains and clearly presents the AoA and respective life-cycle cost information completed in a construct as described afore that could reasonably impact the CE/PME's approval of the recommended alternative. In making such a determination, the ICR Team must consider whether the procedures that a Program Office follows in reaching CD-1 reasonably satisfy OMB Circular A-11 requirements. Section 1.5.3 of the *Capital Programming Guide* (supplement to Part 7 of OMB Circular A-11) states that both the initial acquisition cost and the other life-cycle cost elements of the various alternatives should be considered, and that the selection of the best alternative should be based on a systematic analysis of expected benefits and costs. OMB Circular A-11 further indicates that the fundamental method for formal economic analysis is Benefit-Cost Analysis (BCA). Benefits and costs should be quantified in monetary terms wherever possible. All types of benefits and costs should be included, and should be discussed in a narrative. The level of detail should be commensurate with the size and criticality of the investment. The benefits should be linked to the program goals and needs identified in the Mission Need Statement prepared at CD-0. Benefits and costs should be estimated over the full life-cycle of each alternative considered. Life-cycle costs include all initial costs, plus the periodic or continuing costs of operation and maintenance (including staffing costs), and any costs of decommissioning or disposal. Estimates of costs and benefits should show explicitly the performance and budget changes that result from undertaking the project.

To summarize the preceding paragraph, OMB clearly states:

- Benefit-Cost Analysis (BCA) must be used;
- Life Cycle Costs are part of a BCA; and that
- A quantitative ranking of alternatives based on the results of the BCAs is preferred.

One might think that such an approach would lead invariably to unambiguous numerical scores that support the selection of a preferred alternative. However, the process of selecting the best alternative is often not a wholly quantitative exercise. DOE Program Offices may use qualitative criteria that are inherently un-quantifiable to justify the selection of a particular project alternative, or to exclude certain alternatives from further consideration. The use of qualitative criteria does not exempt a Program Office from the requirement to duly consider all reasonable alternatives using a BCA methodology. PM should, in all cases, verify that a BCA approach is used and should provide an independent evaluation of the quantitative portions of BCAs performed by a Program Office. That being said, a Program Office has comparatively broad discretion in interpreting and determining the best manner to satisfy its mission needs, and that discretion extends to deeming certain alternatives unviable based on what may be inherently unquantifiable criteria. It makes no sense to prepare a LCCE for an inherently unviable alternative. PM should generally not question the use of qualitative, non-quantifiable criteria, unless it considers certain

criteria or the manner in which those criteria are applied to be unreasonable – i.e., it believes that the intent of OMB Circular A-11 has been patently disregarded. Absent such a finding, PM's role in performing an ICR is to help ensure that the PME's decision is made with due consideration of all reasonable alternatives, that it is based on information that is complete and accurate, and that the selection process has used quantitative BCA to the greatest practical extent.

### 4.1.3 ICR at Other Project Phases

An ICR may be conducted at other project phases as requested by the PME or other officials. The scope of the review, documentation required, and the Lines of Inquiry (LOI) (see Appendix C) should be tailored for the specific project phase.

## 4.2 ICR Schedule

Figure 1 is a high-level summary which breaks the ICR process into five phases. Table 2 identifies work activities associated with each phase. The time to conduct an ICR varies and the process can take a nominal 10 to 20 weeks, depending on the scope of the review and the project's complexity.

**Figure 1- Simplified ICR Timeline**

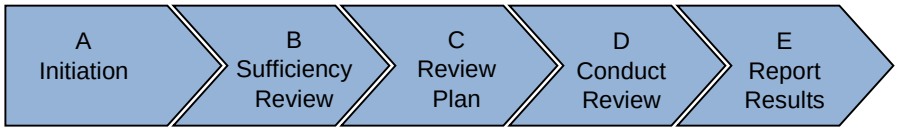



**Table 2 – ICR Phases and Work Activities**

| Phase | Activities |
|---|---|
| A | Initiation Activities- Planning, scoping, SOW and task assignment to SME support team, kickoff meeting |
| B | Sufficiency Review- Receive and evaluate program documents; perform acceptance/sufficiency review (see Appendix D for decision analysis if documentation is not sufficient to continue with ICR) |
| C | Review Plan- Draft and final; coordinating call with project team |
| D | Conduct Review- Additional document review, on-site review, out-brief, completion of document review |
| E | Report Results- Draft report, factual accuracy review, briefings of PM management and program management, issue resolution, final report |

Appendix B contains a GANTT chart based on a Microsoft Project schedule for a hypothetical ICR. The Microsoft Project software template for that schedule is available on the PM "W" Drive:

W:\PM-20\Policy & Guidance\50- SOPs\ICE & ICR (Independent Cost Estimate & Independent Cost Review) SOP. PM analysts are strongly encouraged to use this template as a starting point for planning an ICR. It shows the assumed logic ties between activities, and can consequently be used to easily evaluate various schedule scenarios. It also identifies the parties who are primarily responsible for each activity, which is essential knowledge for all stakeholders.

A logic-driven GANTT Chart that depicts the responsibilities of all parties provides an excellent tool for discussing calendar commitments with stakeholders in a realistic and professional manner. Program Offices and Project Teams frequently ask why it takes so long to complete an ICR, which they may view as a comparatively straightforward evaluation. The "reasons why" are more easily communicated by a good schedule. Of equal importance, opportunities for schedule compression can be readily explored using Microsoft Project software.

## 4.3 ICR Activities and Deliverables

### 4.3.1 Scoping Meeting

PM should initially conduct a "Feds-only" scoping meeting with Program Office representatives to collaboratively define the scope, bounds, and objectives of a cost review. The PM lead should chair the scoping meeting, and attendance should include appropriate Program Office and Project Team personnel, including the designated FPD. If any core review elements are not to be addressed, the reasons should be identified in the scoping meeting notes. Based on the agreed-upon review scope, the scoping meeting attendees should also outline the subject matter expertise and skills required of the team members.

- Appendix A outlines the decision-making process for determining if an ICR or ICE will be conducted, and should be used by the PM representative during the scoping meeting if there is any uncertainty concerning the type of review
- A sample format for documenting the agreed upon scope of the ICR is provided on the PM website (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations). One "takeaway" should be a written Purpose Statement.
- The readiness of the project documentation (see Appendix C) is a critical item in the planning; incomplete or late information will jeopardize the ICR schedule. The required documentation should be one of the principal topics discussed at the scoping meeting.

### 4.3.2 SOW and Contract for Contractor/SME Support

Contractor support is frequently, although not always, required when conducting an ICR.

### 4.3.3 Review Plan

A written review plan should be prepared as soon as possible after the scoping meeting is conducted. The PM lead is responsible for the review plan and should at least prepare an initial draft. On a complex ICR which includes a comparatively large complement of support contractors, it may be prudent and more effective to utilize a support contractor to complete the review plan. The PM lead should, in all cases, approve the final plan.

Some sample review plans are available in MS Word format on the PM "W" Drive. The length and complexity of review plans will vary considerably based on the purpose of the review and the make-up of the review team. However, there are a number of common elements that should be addressed by any ICR. A suggested general outline for a review plan is as follows:

- Purpose and Scope
- Project Description
- Review Process – Describe the various elements of the review process; identify lines of inquiry (Appendix C); provide list of documents required for the review (Appendix C); describe roles and responsibilities
- Schedule – Provide an overall schedule showing, as a minimum, major activities and milestones. The use of a logic-driven GANTT Chart that depicts the responsibilities of all parties is recommended.
- Review Logistics – Dates of site visit; detailed site visit schedule (agenda); report format, report review process and distribution; on-site support requirements
- Team Members and Assignments – Include team member biographies

### 4.3.4 Review

The review includes three basic phases:

1. *Initial Sufficiency Review* to determine whether the Project Team's cost estimate and associated documents have been completed. This review is essentially the same as a Type I ICE (Document Review), as described in Section 5.1.1
2. *Detailed Review* of the Project Team's cost estimate and associated documentation
3. *On-site Review* where the ICR Team can resolve questions raised during the review and gain insight that cannot be gleaned simply by reading the written materials

Appendix D contains review checklists that should be used to help ensure the thoroughness of the review.

### 4.3.4 Report

An ICR Report should be prepared and reviewed by the ICR Team at completion of the review. The ICR Report should contain the following general sections:

- Executive Summary
- Project Background
- Scope of Work and respective Key Performance Parameters
- Cost Estimating Process
- Basis of Estimate
- Schedule
- Risks
- Summary of Findings
- Recommendations

The length and level of detail in the report should be tailored based on the stage (e.g., CD-0, CD-1 or CD-2) and complexity of the project. An ICR is referred to as a Reasonableness Review. The ICR Team is expected to review all available project documentation, receive briefings from and hold discussions with the Project Team, complete sufficient analysis to assess the reasonableness of the project assumptions supporting the cost and schedule estimates, ascertain the validity of those assumptions, assesses the rationale for the methodology used, and check the completeness of the estimate, including appropriate allowances for risks and uncertainties. The result should be a report that sufficiently documents what work was done and that details the findings and recommendations.

Draft and Final reports should be issued. 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.

## 5. CONDUCTING AN INDEPENDENT COST ESTIMATE

An ICE[2] is a cost estimate prepared by an organization independent of the project sponsor, using the same detailed technical and procurement information that was used to make the project estimate. PM uses an ICE to validate the project estimate and determine its reasonableness. The actual validation is normally done by an External Independent Review (EIR) team that has access to both the ICE and the Project Team's estimate. An ICE typically uses alternative methods and tools to those used for the project estimate. In addition, an independent risk analysis and an independent schedule should also be developed.

The following sections provide details on types of ICEs; ICE requirements at each critical decision; technical and schedule requirements for ICEs; preparation of an ICR report; and, reconciling an ICE with a Project Team estimate. In addition:

- Appendix E contains a notional ICE GANTT Chart Schedule
- Appendix F provides a list of documents that an ICE Team typically needs in order to prepare an estimate

The PM website contains a Statement of Work template for use when obtaining contractor support for an ICE (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations).

For all ICEs, the ICE Team should evaluate the project cost estimate against GAO's Twelve Steps of a High-Quality Cost Estimating Process. This evaluation should be documented within an Appendix of the report. In addition, a self-evaluation should be submitted of the IPT's evaluation and against the same GAO process aforementioned, also contained within an Appendix of the report.

### 5.1 Types of ICRs/ICEs

A PM-sponsored ICE is normally prepared assuming an unconstrained budget, which should represent the most cost-effective method of execution. However, if the Project Team's proposed cost and schedule baselines are based on constrained funding, then it is appropriate to prepare the ICE based on the funding profile provided by the Program Office.

DOE classifies ICEs into four Types (or methods) and ICRs into two Types, which are described below. The overall ICE designation will be determined based on an evaluation of the design maturity and respective technical documentation, and per industry guidelines including AACEi, is typically is designated with the least mature elements.

DOE ICE types should not be confused with estimate accuracy classes, which have a different numbering system. See DOE Guide 413.3-21, Cost Estimating Guide, for further information on estimate classes and DOE ICE Types.

PM Lead will determine level of detail, if any, of the project cost estimate and detailed information such as commodity quantities, installation rates and schedule durations will be supplied to the

[2] The definition used in this document is taken from DOE O 413.3B, and applies to ICEs performed by PM.

ICE team. The Project Team's cost estimate and detailed information may be retracted in order to mitigate estimate bias by the independent estimating team commissioned. The determination of information to be retracted will be by the PM Lead, coordinated and ensured through the ICE Contractor Lead, and be upheld by the project team in their document transmissions and discussions with ICE Contractor.

### 5.1.1 Independent Cost Review Types

#### 5.1.1.1 Documentation Review

This type of review is not normally performed as an ICR, since it does not fulfill the Critical Decision requirements as specified in DOE O 413.3B. It is merely an inventory of existing documents to determine that the required support documentation exists and to identify any missing data. This type of review can be beneficial for a project that must prepare for an upcoming EIR or ICR, to ensure readiness to proceed with those activities, or when a cursory review is specifically requested at times other than critical decisions. It is analogous to the Sufficiency Review that is performed as part of an ICR (see Section 4.3.4).

#### 5.1.1.2. Reasonableness Review

This is the same as described in DOE O 413.3B definition of an ICR (see Section 4). For this review the ICE Team reviews all available project documentation[3]; receives briefings from and holds discussions with the Project Team; completes sufficient analysis to assess the reasonableness of the project assumptions that support the cost and schedule estimates; ascertains the validity of those assumptions; assesses the rationale for the estimating methodology used; and checks the completeness of the estimate, including appropriate allowances for risks and uncertainties. The result is a report that details the findings and recommendations.

### 5.1.2. Independent Cost Estimate Types

#### 5.1.2.1. Parametric Estimating Approach (Type III ICE)

This approach utilizes parametric techniques, factors, etc., to analyze project costs and schedules in addition to assessing the reasonableness of the project assumptions that support the cost and schedule estimates; ascertains the validity of those assumptions; assesses the rationale for the estimating methodology used; and checks the completeness of the estimate, including appropriate allowances for risks and uncertainties. It is usually accomplished at a summary WBS level. The parametric techniques—including cost estimating relationships (CERs) and factors - should be based on accepted historical cost/schedule analyses. An estimate with a minimum of 75 percent of the TPC based on parametric techniques is classified as a parametric estimate. This method analyzes data from completed analogous programs and is derived using the most defensible mathematical and statistical techniques.

[3] PM Lead will determine level of detail, if any, of the project cost estimate and detailed information such as commodity quantities, installation rates and schedule durations that will be supplied to the ICE team. The Project Team's cost estimate and detailed information may be retracted in order to mitigate estimate bias by the independent estimating team commissioned.

#### 5.1.2.2. Sampling Approach (Type IV ICE)

This type of ICE identify the key cost drivers in addition to assessing the reasonableness of the project assumptions that support the cost and schedule estimates; ascertains the validity of those assumptions; assesses the rationale for the estimating methodology used; and checks the completeness of the estimate, including appropriate allowances for risks and uncertainties. A "cost driver" is a major estimate element whose sensitivity significantly impacts TPC. Detailed, independent estimates should be developed for these cost drivers. Such estimates should include vendor quotes for major equipment, and detailed estimates of other materials, labor, and subcontracts. For the balance of the project costs, the Project Team's estimate may be used (if deemed reasonable), or, if appropriate, parametric techniques may be used for certain portions of the project costs. An estimate which provides a detailed cost for all cost drivers is classified as a Sampling Estimate. Note that cost drivers are both the key elements making up the estimate and elements that significantly influence the estimate, such as special process equipment or systems, structural features, and hazard category requirements. An independent schedule assessment and cost/schedule risk analyses are typically conducted as well.

#### 5.1.2.3. Bottom-up Estimating Approach (Type V ICE)

This is the most detailed and extensive ICE effort. It begins with the activities needed for a Reasonableness Review[3]. In addition, this approach requires a detailed bottom-up independent cost estimate, a schedule assessment, and an independent cost/schedule risk analysis. This will require quantity take-offs/development, vendor quotations, productivity analysis, use of historical information, and any other means available to do a thorough and complete estimate of at least 75 percent of the project's cost. It may not be possible to do a completely independent estimate on some portions of the project estimate, and for those portions – which should not exceed 25 percent of the total estimate – the project estimate may be used if it has passed the test of reasonableness. (Reasonableness reviews are discussed as part of the ICR process using appropriate LOIs and concluding that the process and results are satisfactory and fit for the estimate purpose.)

## 5.2 ICE Requirements at Each Critical Decision

The purpose for an ICE and the manner in which it will be used depends primarily on the stage of project development at which it is performed. The technical requirements for an ICE at various different critical decisions are discussed in the following several sections. The ICE should be conducted in accordance with best industry practices and DOE guidance, which includes the DOE 413 Guide series and the DOE EV IH as well as following GAO best practices, specifically those for high quality cost estimates and schedule assessments.

### 5.2.1 ICE at CD-1

DOE O 413.3B requires PM to perform an ICR or ICE at CD-1 for projects with a TPC greater than or equal to $100 million. The scoping process conducted with the Program Office and/or Project Team should initially determine if an ICR or ICE is to be conducted. Appendix A provides guidance for determining whether an ICR or an ICE is required.

As discussed in Appendix A, if an ICR is initiated at CD-1, it may subsequently develop into an ICE under certain circumstances. If an ICE is performed, the expectation is that a Type III ICE

(Parametric Estimate) would be the most appropriate type of ICE for this project stage. However, the specifics as to the estimating methods to be used should be developed as part of the Estimate Plan.

At CD-1, project cost and schedule ranges are established for the selected alternative and other alternatives are also evaluated. Life-cycle costs are also evaluated and used in selection of the preferred alternative. A LCCE should be prepared for each of the alternatives for which cost was an evaluation criterion. See Section 4.1.2 for a more detailed discussion of LCCE requirements at CD-1. The considerations identified in Section 4.1.2 are applicable irrespective of whether PM performs an ICR or prepares an ICE.

### 5.2.2 ICE at CD-2

DOE O 413.3B and Public Law 2055[4] require that an ICE be prepared at CD-2 for projects with a TPC greater than or equal to $100 million. Depending on the maturity of the project design at CD-2 and other factors, the ICE could range from Type III to Type V, with a combination of Types III and IV being most likely. DOE O 413.3B, Section C.4, Design Maturity, discusses the appropriate maturity depending on various project factors. Section 5.1 and Appendix A of this SOP provide further guidance on the type of ICE to be conducted. The specific methods to be used will be determined as part of the Estimate Plan preparation.

DOE O 413.3B also requires that an EIR be performed at CD-2 for any project with a TPC ≥$100 million. Although there may be efficiencies in performing an EIR and an ICE in sequence under a single task award, separate ICE and EIR reports should be issued. The ICE Team is separate from the EIR team, not so much because the EIR team must be "independent" of the ICE Team[5] as because an EIR and an ICE require different skill sets. The ICE should be completed before the EIR begins its review. This allows the EIR team to utilize the ICE report in its assessment of the sufficiency and reasonableness of the TPC and schedule proposed by the Project Team.

### 5.2.3 ICE at CD-3

Public Law 2055[6] requires that an ICE be prepared at CD-3 for projects with a TPC greater than or equal to $100 million. At CD-3, the project design should be complete enough to allow a Type V ICE to be performed. However, a Type V ICE is usually the most detailed type of ICE, and consequently the most time-consuming and expensive to prepare. Thus, while information is available at the necessary detail to facilitate the preparation of a Type V ICE, it is prudent to ask whether there is sufficient "added value" in doing so. Available time and budget frequently factor into the decision making process. Sections 5.1 and Appendix A of this SOP identify some of the factors to consider in determining CD-3 ICE requirements. In all cases, actual post-CD2 performance should be weighed heavily. If a project already appears to be "off-track" by the time it requests CD-3, then the CD-3 ICE assumes greater importance than it might otherwise have.

A project's Acquisition Strategy is an important consideration in determining what type of ICE is most appropriate at CD-3. At one extreme is the case in which a CD-3 approval request is based on competitively bid, firm fixed price proposals that have already been received. In one sense, an actual bid price can be considered the "gold standard" for cost estimates, because it represents

[4] See Section 1.
[5] There is no legal requirement or DOE policy that requires an EIR team and an ICE Team to be separate or to work in isolation from each other.
[6] See Section 1.

a price to which a contractor is willing to commit. Furthermore, if more than one bid was received, the multiple bids can be viewed as multiple independent estimates. One is hard-pressed to justify the need for and utility of an additional Type V ICE prepared by PM under these circumstances. Provided that the ICE Team is provided access to all of the bid information as well as to the Project Team's cost estimate[7], then it is reasonable to perform a Type II or Type III ICE. At the other extreme is the case where all or most construction/execution phase work will be performed under a cost-reimbursable contract that was not competitively awarded, and there have been substantial post-CD-2 technical scope or funding changes. In this scenario, a Type II ICE would be inappropriate, but at the same time Type V might not be needed if an ICE was prepared at CD-2. A combined Type III and Type IV may well be the most appropriate. There are many scenarios that fall in between these two extremes.

The level of design maturity at which the cost estimates at CD-2 were based is another important consideration in determining what type of ICE to prepare at CD-3. Not achieving a high enough level of design maturity prior to CD-2 has been identified as a "root cause" of many project cost overruns. Consequently, if the TPC and CD-4 date approved at CD-2 were not based on a completed or nearly completed design, then a more rigorous ICE than might otherwise be needed at CD-3 may be called for.

On the other hand, there may be no additional design or other information available at CD-3 than were available at CD-2, in which case a Type II ICE may be appropriate. In some cases, technical considerations that have no significant cost implications preclude a CE from simultaneously approving CD-2 and CD-3. For example, a final safety or environmental permit approval may be a precondition for CD-3, but not for CD-2. In such a case, CD-3 approval might lag CD-2 approval by months or even a year or more. However, full design information was available at CD-2, and there may have been no significant changes to scope, execution strategy or funding since CD-2. Under such circumstances, all that should be required is to verify that all of the assumptions on which the approved CD-2 baseline was based remain valid. This can be done through a Type II ICE and, perhaps, even through a Type I ICE.

An ICE may be requested in between critical decisions. The most likely circumstance under which this occurs is when a project runs over budget or changes scope and submits a Baseline Change Proposal (BCP) for CE approval. An ICE, if required, should be scoped using the guidance in Appendix A, as well as the information in this Section 5.2.3. An ICE under these circumstances may be highly tailored to "fit" the ICE to the need or use. Typically, such an ICE must focus only on the cost to complete the remainder of the work, and many risks that existed in earlier stages of the project will either have been realized or "retired" because it is clear that they will not be realized.

### 5.2.3 ICE at CD-3A

CD-3A, Long Lead Procurements, per DOE O 413.3B require that an ICE be prepared at CD-2 for projects with a TPC greater than or equal to $100 million (albeit the CD-3A TPC may be lessor than the $100M threshold). The CD-3A ICE processes and expectations are the same as those outlined for CD-2 and CD-3 within this document. The type of ICE should be commensurate with the scope of the CD-3A and the ICE processes should be tailored to provide information to the

[7] It is assumed that the Project Team will have updated the cost estimate that it prepared at CD-2 based on the bid results and any post-CD2 technical scope or funding changes.

CE/PME while being efficient with government resources. As many CD-3A packages will be rolled into the CD-2 baseline, specific emphasis should be placed on providing the CE/PME with discussion of risks (technical, cost and schedule) of the CD-3A, but also the direct risk posed on the impending CD-2 performance baseline.

## 5.3 ICE Schedule

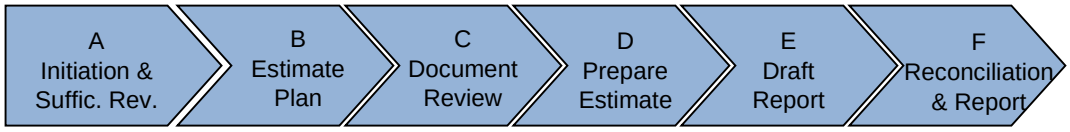
Figure 2 summarizes the ICE process, breaking it into six phases. Table 3 identifies work activities associated with each phase, and cross-references them with activities in the GAO 12-Step Cost Estimating Development Process. The time to conduct an ICE varies widely and depends on many factors to include the scope of the estimate and size and complexity of the project, with durations ranging from 3 to 38 weeks. The ICE timeline should be tailored to accommodate the situation unique to each project.

Appendix E contains a notional GANTT chart display of a Microsoft Project schedule for a hypothetical ICE. The Microsoft Project software template for that schedule is available on the PM "W" Drive: W:\PM-20\Policy & Guidance\50- SOPs\ICE & ICR (Independent Cost Estimate & Independent Cost Review) SOP. PM analysts are strongly encouraged to use this template as a starting point for planning an ICE. It shows the assumed logic ties between activities, and can consequently be used to easily evaluate various different schedule scenarios. It also identifies the parties who are primarily responsible for each activity, which is essential knowledge for all stakeholders.

Post completion of the sufficiency review, PM leadership (PM-2) will be briefed on the status of the review and provides concurrence to the ICE/ICR Team for continuation of the estimate/review.

The ICE process, while similar to the ICR process in many respects, differs significantly in that an ICE results in a cost estimate which is reconciled with the Project Team's estimate. The reconciliation process is not the same as the corrective action process which is used in both ICRs and EIRs. The conclusion of the ICE activities does not necessarily signify a resolution of differences that results in agreement between the two estimates. There may continue to be differences between an ICE and a Project Team estimate even following reconciliation. Section 5.4.6 provides additional information on the ICE reconciliation process.

**Figure 2. Simplified ICE Process Diagram, Timeline, and Comparison to GAO Estimating Process**




| Table 3 – ICE Phases and Work Activities | | |
|---|---|---|
| **Phase** | **Activities** | **GAO 12-Step Process** |
| A | Initiation—activities including scoping meeting, task assignment to SME support team, kickoff meeting | Step 1-Document purpose |
| B | Sufficiency Review and Estimating Plan—Draft & Final | Step 2-Develop plan |
| C | Documentation Review—review project documents, develop questions/issues On-site review – data collection and clarifying interviews with project | Step 3-Define program characteristics<br>Step 4-Determine estimating structure<br>Step 5-Identify ground rules and assumptions,<br>Step 6-Obtain data |
| D | Prepare Estimate—Estimate preparation and review – includes estimate and risk/uncertainty analysis | Step 7-Develop point estimate and compare to project estimate<br>Step 8-Conduct sensitivity analysis,<br>Step 9-Review/conduct risk and uncertainty analysis |
| E | Draft Report—draft Estimate Document -- including team review; PM review of draft | Step 10-Document the estimate |
| F | Reconciliation & Final Report—resolution process; Briefings—PM management and Program Office; PMRC; Final Estimate Document to reflect reconciliation and PM/Project comments. Note. Partial reconciliation may have been performed for after the review of project assumptions and baseline (see Section 7.8) | Step 11-Present estimate to management for approval<br>Step 12-Update estimate<br>(Note: reconciliation is a process for an independent estimate and not an initial estimate as covered in the GAO guide) |

## 5.4 ICE Activities and Deliverables

### 5.4.1 Scoping Meeting

PM should initially conduct a “Feds-only” scoping meeting with Program Office representatives to collaboratively define the scope, bounds, and objectives of an ICE. The PM Lead should chair the scoping meeting, and attendance should include appropriate Program Office and Project Team personnel, including the designated FPD. If any core review elements are not to be addressed, the reasons should be identified in the scoping meeting notes. Based on the agreed-

upon review scope, the scoping meeting attendees should also outline the subject matter expertise and skills required of the team members.

- The PM website contains a Statement of Work Checklist for use when obtaining contractor support for an ICE (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations).
- Appendix F identifies documents that the ICE Team will normally need in order to prepare its estimate. The availability of the project documentation is a critical item in the planning; incomplete or late information will jeopardize the ICE schedule. The required documentation should be one of the principal topics discussed at the scoping meeting.

### 5.4.2 SOW and Contract for Contractor/SME Support

Contractor support is almost always required when conducting an ICE. In some instances, the entire estimate is performed by a single contractor on a "turnkey" basis. In this context, another government agency such as the U.S. Army Corps of Engineers which prepares an ICE on behalf of PM is considered a contractor.

A sample format (Scoping Meeting Agreement Template) for documenting the agreed upon scope of the ICE is provided on the PM website (http://energy.gov/management/office-management/operational-management/project-management/reviews-and-validations). One "takeaway" should be a written Purpose Statement for the ICE.

### 5.4.3 Estimate Plan

A written estimate plan should be prepared as soon as possible after the scoping meeting is conducted. The PM Lead is responsible for the plan, and should at least prepare an initial draft. However, PM requires contractor support on all ICEs, because it does not have cost estimators on its staff. On very large, complex projects, the ICE may be prepared entirely by a contractor, essentially on a "turnkey" basis. In such cases, it is appropriate to have the Contractor Lead prepare the estimate plan. When the estimate will be delivered on a turnkey basis by a contractor who utilizes its own standardized ICE plans and procedures, it is appropriate to allow the contractor prepare utilize its own format for the estimate plan.

A suggested general outline for a review plan is as follows:

- Purpose and Scope
- Project Description
- Estimate Process – Describe the type of estimate; the estimate approach, including QA/QC steps; provide list of documents required for the review; describe roles and responsibilities
- Schedule – Provide an overall schedule showing, as a minimum, major activities and milestones. The use of a logic-driven GANTT Chart that depicts the responsibilities of all parties is recommended.
- Logistics – dates of site visit; detailed site visit schedule (agenda); report format, report review process and distribution; on-site support requirements
- Team Members and Assignments – include team member biographies

### 5.4.4 Estimate

The process for conducting an ICE is similar to that for an ICR insofar as it begins with the collection of necessary documents and a subsequent sufficiency review to determine if any further information is required to complete the work. However, an ICE is fundamentally different from an ICR in that its end product is a self-contained deliverable that contains a cost estimate, schedule, and risk assessment that are independent of the work of the Project Team.

A certain amount of interaction with the Project Team is typically required so that the ICE Team can develop an adequate understanding of the scope of the project and of any limitations on how it will be executed. In this regard, it is acceptable – and usually desirable - for the ICE Team to be provided with the Project Team's Work Breakdown Structure (WBS). ***It is strongly recommended that the ICE be developed and presented using the same WBS as the Project Team's estimate***. This makes direct comparison of the two estimates much simpler.

Similarly, it is acceptable for the ICE Team to utilize the same schedule logic as the Project Team. Again, this makes subsequent comparison and reconciliation far easier. As long as the ICE Team independently develops its own resource and duration estimates for all work activities, the ICE can be considered to be truly independent of the Project Team's. The ICE Team must also perform its own risk analysis.

The ICE Team may consider the WBS and/or schedule logic proposed by the Project Team to be unworkable or undesirable. If so, the PM lead should be notified for a determination on how to proceed. To preserve the independence of the estimate, it is preferable to allow the ICE Team to make any adjustments to the WBS or schedule logic it considers necessary in order to execute the work in the most efficient manner possible.

The ICE should be prepared assuming that adequate funding is available without constraints, or on the funding profile proposed by the Project Team.

### 5.4.5 Report

At the end of the estimate preparation, the ICE Team prepares a report to document the ICE process and results. A draft report is prepared initially, followed by a factual accuracy review, estimate reconciliation, and a final report. The process is outlined in the following steps:

1. A draft report is generated which represents the consensus of the ICE Team, and which includes the team leader's observations and comments.
2. The draft report is transmitted to the project office for review and comment.
3. The ICE Team reviews the comments to determine whether the major differences between the project estimate and the ICE can be resolved via a teleconference, or if a face-to-face meeting is required for reconciliation.
4. The ICE Team and Project Team conduct reconciliation activities.
5. A final ICE report is prepared, which reflects any changes resulting from the reconciliation process.

**Nominal Contents for the ICE Report:**

- Executive Summary
- Background (including project cost/baseline history)
- Project Status
- Scope Baseline Description (including project scope statement)
- Information available to the ICE Team
- Cost estimate method(s) used
- Assumptions (for both Project and Estimating team)
- Cost estimate results
- Cost Variance Analysis by WBS
- Schedule Analysis/Variance
- Funding Profile Analysis/Variance
- Independent Risk Analysis
- Contingency Analysis
- Reconciliation of Open Items
- Reconciled Results
- Conclusions
- Appendices (Assignments and bios of team members, cost tables, others as needed)

If an ICE is performed in conjunction with an EIR, separate ICE and EIR reports should be prepared, and the ICE report should either be incorporated into the EIR report by reference or included as an attachment. The cost section of an EIR report has very specific format requirements, including a number of cost summary tables that must be completed. Those tables are included in Appendix B of this SOP. Pertinent cost data that is needed for the EIR should be extracted from the ICE report and adapted as necessary to meet the format requirements of the EIR report.

For archival purposes, the ICE Team should save the report and review plan, as well as all documentation gathered from the review. The ICE Team should identify Lessons Learned as applicable, in separate correspondence (not part of the ICE report).

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

### 5.4.6 Reconciliation

Any substantial differences between an ICE and a Project team's cost estimate should be formally reconciled. This pertains both to the TPC and to individual elements of the estimates. Although PM's primary focus is on the TPC, any significant difference in sub-elements of the estimates should also be addressed. DOE has no standard definition of what constitutes a substantial cost difference. However, as a rule of thumb, if the ICE TPC differs from the Project team's cost estimate by more than 10 percent, a formal reconciliation should be performed. If the ICE and Project team TPCs are within 10 percent of each other, any differences should be identified and discussed, but formal reconciliation may be unnecessary. However, any differences that have a significant bearing on PM's ability to validate a performance baseline must be adequately explained and understood.

Ideally, reconciliation includes direct discussions between the ICE Team estimators and the Project team estimators. Direct discussions are the optimum way to clarify what assumptions

each estimating team made when preparing its estimate. Each estimating team is charged with presenting its opinion of what the project should cost based on its understanding of the work, the expertise of its members, and its evaluation of project risks. Differences in approach, including fundamental issues as the type and size of the project organization, are normal, and neither estimating team is necessarily either correct or incorrect.

One reconciliation "ground rule" is that estimates should be adjusted, as appropriate, to correct any errors or improper interpretations of project requirements. Any remaining differences should be identified and explained, but neither estimate should be changed. Such differences provide insight into the risk and uncertainty entailed in executing the project. The fact that two estimates differ does not necessarily mean that one is more credible than another. The goal is to identify, assess and understand those differences, and to communicate them so that the Program Office and the Project Management Executive can make an informed decision and commitment of budgetary and human resources.

When direct discussions are not possible, the ICE Team should identify significant differences between the two estimates and present its analysis of the reasons for the differences. The level of detail in this estimate may be somewhat limited due to the likely need to make assumptions concerning certain aspects of the Project team's estimate.

The ICE Team should keep the following points in mind when reconciling its estimate:

- The ICE and the Project Team estimate should be updated based on new information, clearer understanding, or to correct errors.
- The reconciliation should focus on possible differences due to:
  - Program definition and scope (including WBS definitions)
  - Estimating ground rules and assumptions
  - Consistency of the estimating methods relative to the program definition & scope
  - Limitations of estimating methods
  - Inputs for estimating methods
  - Interpretation of the sources and impacts of risk
- Reconciliation can be done in stages – e.g., ground rule assumptions, evaluation of baseline, completion of estimate
- Reconciliation does not necessarily mean consensus
- Reconciliations are non-adversarial

The distinction between what a project *should cost* and what it "will cost" is often discussed when reconciling estimates. An ICE is not tied to a particular contractor's approach, nor is it bound by any particular biases of the Project Team or of the sponsoring DOE Program Office. An ICE is supposed to provide an independent, external look at the project, and it typically provides an estimate of what the project *should cost* if prevailing industry/market practices are followed. However, this is not necessarily what the project *will cost* if a particular contractor performs the work using a different delivery method than that on which the ICE was based. For example, when a M&O contractor will be performing the work, it is not uncommon for the Project Team's cost estimate to be higher than the ICE. The ICE may assume that a considerable amount of subcontract work will be performed using competitively bid firm fixed-price subcontracts, whereas the Project Team's estimate may assume that the M&O contractor will self-perform most of the work. In such an instance, the Project Team's estimate is probably a more accurate reflection of what the work *will cost* if the M&O contractor performs all of the work.

There is no need for either estimate to be changed in an instance such as this. The reconciliation should note the differences in contracting methods and the estimated cost differences attributable to those methods. If the ICE Team considers the proposed TPC to be unreasonably high, and PM shares that view, it should so notify the FPD, the Program Office, and the CE. However, PM would probably, at the same time, validate the adequacy of the TPC. The CE may approve the TPC despite PM's views concerning its unreasonableness, or may direct the Project Team to find a more cost effective delivery method. In either case, PM would have met its obligation to ensure that the CE was properly informed regarding project costs.

DOE's actual costs on nuclear construction projects have frequently exceeded original estimates, even when an ICE has been performed. The inability to accurately estimate the costs of nuclear construction projects is due largely to a lack of sufficient high-quality, empirical cost information for nuclear projects of the type that DOE executes. This problem is attributable, in part, to DOE's past failure to collect and assemble meaningful historical cost information on its own projects. However, this is not the only reason. The nuclear industry has been in decline for several decades, and even recent cost data from the commercial nuclear industry is limited in availability. In addition to a lack of suitable empirical cost information, there are not that many engineers and cost estimators with recent experience on nuclear projects. One result of this inexperience can be wider-than-expected variations in estimating assumptions concerning project organizations, required staffing levels and productivity rates. These are some of the factors that should be explored and analyzed, as applicable, during reconciliation. When there are significantly different assumptions regarding staff levels and productivity, the ICE Team should ensure that these differences are adequately addressed in both the ICE Team and Project team's Risk Assessments. Generally speaking, it is not prudent for either team to assume that its approach is more credible without identifying an off-setting risk or opportunity, as applicable, in the Risk Assessment.

It is important to understand that both estimates may be well-prepared and credible, yet differ considerably. Interpreting the differences between an ICE and a Project Team's cost estimate is much the same as analyzing competitive bids. It is not uncommon for there to be significant differences in the cost estimates submitted by various contractors submitting competitive proposals for a project. The challenge in evaluating those proposals is to understand the factors that led to the differences between the various estimates, and to carefully consider how those factors are likely to impact actual project costs. There is often no practical way to force all of the estimates to "agree", nor is it necessarily appropriate to assign a higher level of credibility to any particular estimate. It is generally accepted that actual project costs will fall within a certain range, and the degree to which two or more cost estimates differ provides insight into how wide or narrow that range is likely to be, and therefore the degree of risk and uncertainty that is entailed in undertaking the project.

As a final note, the "core" cost elements of an ICE *should not* be increased so that the ICE conforms more closely to a Project team's estimate. However, it may be appropriate to increase risk allowances to ensure that the risk associated with any large estimating differences is adequately recognized within the formal risk analysis. PM relies on formal risk assessment and management processes to ensure that a Performance Baseline accounts for the numerous variables that will have a bearing on the actual cost of a project. Those procedures should take into account estimating differences and uncertainties. DOE's goal is to ensure that a Performance Baseline is based on credible estimates, and that all reasonably foreseeable risks and uncertainties are adequately addressed in a project's risk management plan. The expected result

is a Performance Baseline that includes sufficient amounts of cost and schedule contingency to ensure with a high level of confidence that the project will be completed on time and within budget.

## 6. ICE/ICR EVALUATION AND FEEDBACK

Evaluation and feedback is highly encouraged and valued in an effort to continuously improve and add value to project reviews and independent estimates. Program offices, Project Teams, and PMSOs are encouraged to provide PM with feedback on the conduct of the review, including any comments related to:

- Scoping meeting
- Review/Estimate Plan development
- Knowledge and professionalism of the review/estimate team members
- Preparation and support of the review/estimate team
- Resolution conference
- Timeliness and responsiveness of PM and the review/estimate team
- Quality of the review/estimate and findings/issues/results

A feedback form is available on the PM "W" Drive at the following link: \\doe.local\dfsfr\ORG_PM\PM-20\Policy & Guidance Documents\SOP Materials. The PM lead will distribute forms to the FPD and Program Office representative. Upon completion, the forms should be transmitted to the PM section leader who oversees ICEs and ICRs. That individual will share the information, as appropriate, with the PM Contracting Officer's Representative (COR) who oversees support contractors. The confidentiality of the submitter(s) of the forms will be maintained, and feedback will be communicated only through compilations.

## 7. LESSONS LEARNED FROM PREVIOUS ICEs and ICRs

A number of useful lessons that PM has learned in the past several years are presented below.

1. Provide adequate time for the sufficiency review to ensure the project is prepared for the ICE/ICR.
2. Escalation. Neither PM nor DOE prescribes the use of a particular escalation rate. Generally, the best available information at the time for the particular project location(s) should be used.
    a. However, until further notice, PM has determined that for nuclear (NQA-1) projects, using 4% will result in a conservative estimate that provides reasonable headroom for the project as the economy continues to recover. In its August 2012 Construction Economics forecast, Gilbane Building Company (17th on ENR's Top 400) recommends escalation factors of 4% in FY12, 5% in FY13 and 6% in FY14. This growth is based in part on a combination of volume growth (construction spending for 2012 year-to-date is up approximately 9% over 2011) and a small but continuing growth in contractors' margins. Similarly, AGC trends for 2013 - 2017 call for an increase between 6%-10% in total construction spending with material costs increasing between 3%-8%, labor increasing 2%-4% (primarily due to retirements and construction workers leaving the industry for other fields) and bid prices climbing between 2%-5% as companies increase margins.
    b. The estimate should be presented in base year dollars as well as then year dollars. The estimate should facilitate isolating the dollars associated with escalation. The application of escalation should facilitate comparison between two estimates and further analysis if needed by other entities.
3. Risk assessments and resulting calculations of DOE Contingency and Management Reserve allowances (both cost and schedule) may fail to properly distinguish between DOE Risk and Contractor Risk.
4. A risk register may include risks that more properly lie outside the project. A cost estimate should identify “bounding assumptions” which represent elements which are not included in the estimate and which, if needed or occurring during project execution, will require or result in a baseline change that is not intended to be covered or funded by project reserve allowances (management reserve and/or DOE contingency).
5. A project’s “*hotel load*” may not be clearly identified and consequently, may not be adequately understood and appreciated by the Project Team. Particularly on cost reimbursable projects, unrecoverable schedule delays lead directly to cost increases that are roughly equal to the hotel load during the delay period. It is important to ensure that the costs associated with schedule delays are recognized in the risk register, and a solid estimate of a project’s hotel load is needed to accurately predict those costs.
6. A TPC should include the cost of all work that is “in scope”, regardless of which organization performs the work or how it is funded.
    a. Project interfaces are often inadequately defined. This has a direct bearing on a cost estimator’s understanding of the project scope. The accuracy of a cost estimate relies on having a fully defined scope. In this respect, it is essential to know what is “in” a project, and what is “out”. There are often significant *physical* and *organizational* interfaces or limits.
    b. Physical limits. In the chemical processing field, the term “battery limits” is used to describe one or more geographic boundaries, imaginary or real, enclosing a plant or

unit being engineered and/or erected, established for the purpose of providing a means of specifically identifying certain portions of the plant, related groups of equipment, or associated facilities. All work scope within the "battery limits" of a project is part of the project; work scope outside the battery limits is not. The concept of battery limits should be applied to all types of capital asset projects, and its "battery limits" should be clearly defined. This is typically done on the project drawings, but it is also useful to include a narrative in the PEP that defines the physical limits of the work to be performed.

c. Organizational Limits. The transition between when construction ends and when facility operations start should be clearly defined. Conceptually, a project should be "complete and usable" when construction has been completed, which implies that commissioning has been completed. In addition, on a nuclear project, the project should have successfully completed its Operational Readiness Review (ORR) prior to CD-4. These rules are not necessarily inviolate, and some discretion in defining project completion is appropriate. However, any such discretion should be exercised and unequivocally documented prior to CD-2.

    i. There can be genuine confusion about whether to classify certain activities and their associated cost as being part of a project. This is particularly true in an M&O contract environment, where services provided by the same employee may be part of a project under one set of circumstances, and be oversight functions that are not project costs under slightly different circumstances. One common example are the costs to make physical tie-ins between new and existing infrastructure, which could reasonably be classified either as a project or a non-project cost, depending on where the "battery limits" of the project were initially drawn.

    ii. The full extent of certain project activities is not always adequately understood. For example, one estimate included costs for the DOE portion of an Operational Readiness Review (ORR), but included no costs for the contractor-led ORR that normally precedes the ORR.

7. It may be impossible, practically speaking, to make a side-by-side comparison of two independent estimates that follow different WBS structures. For this reason, it makes good sense to prepare an ICE using the same WBS structure as the Project team's cost estimate.

8. Failure to provide and/or document a cost estimate range has been a common problem in CD-1 packages.

9. Failure to perform/provide a suitable Life Cycle Cost Estimate (LCCE) has also been a common problem at CD-1. The CD-1 documentation should include a thorough AoA process using the GAO – 22 step best practices identified for selecting the preferred alternative. If the LCCE is a significant factor in the alternative selection recommendation, then the Project Team should have prepared LCCEs for all the alternatives as noted in OMB Circulars A-11 and A-94. As a minimum requirement, a LCCE is needed for the preferred alternative, and the LCCE should be of high enough quality to allow the Program Office and CE to make fully informed decisions regarding the project's affordability.

## ACRONYMS

| | |
|---|---|
| AS | Acquisition Strategy |
| BCP | Baseline Change Proposal |
| CD | Critical Decision |
| CDR | Conceptual Design Report |
| CNS | Chief of Nuclear Safety |
| CE | Chief Executive for Project Management |
| CSDR | Conceptual Safety Design Report |
| CSVR | Conceptual Safety Validation Report |
| CTA | Central Technical Authority |
| DA | Deputy Administrator |
| DOE | U.S. Department of Energy |
| EIR | External Independent Review |
| EO | Executive Order |
| ESAAB | Energy Systems Acquisition Advisory Board |
| EVMS | Earned Value Management System |
| FAR | Federal Acquisition Regulation |
| FPD | Federal Project Director |
| FY | Fiscal Year |
| G | Guide |
| GAO | Government Accountability Office |
| GPP | General Plant Project |
| ICE | Independent Cost Estimate |
| ICR | Independent Cost Review |
| IH | Interpretation Handbook |
| IPR | Independent Project Review |
| IPT | Integrated Project team |
| ISM | Integrated Safety Management |
| ISMS | Integrated Safety Management System |
| KPP | Key Performance Parameter |
| LEED | Leadership in Energy and Environmental Design |
| LOI | Lines of Inquiry |
| MIE | Major Items of Equipment |
| MNS | Mission Need Statement |
| M&O | Management and Operating |
| NDIA | National Defense Industrial Association |
| NNSA | National Nuclear Security Administration |
| NQA | Nuclear Quality Assurance |
| O | Order |
| OBS | Organizational Breakdown Structure |
| OE | Operating Expense |
| OMB | Office of Management and Budget |
| OPC | Other Project Costs |
| ORR | Operational Readiness Review |
| PARS | Project Assessment and Reporting System |
| PASEG | Planning & Scheduling Excellence Guide |
| PB | Performance Baseline |
| PDRI | Project Definition Rating Index |
| PDS | Project Data Sheet |

| | |
|---|---|
| PDSA | Preliminary Documented Safety Analysis |
| PED | Project Engineering and Design |
| PEP | Project Execution Plan |
| PHAR | Preliminary Hazard Analysis Report |
| PL | Public Law |
| PMB | Performance Measurement Baseline |
| PM | DOE's Office of Project Management Oversight and Assessments |
| PMRC | Project Management Risk Committee |
| PMSO | Project Management Support Office |
| PSDR | Preliminary Safety Design Report |
| PSO | Program Secretarial Officer |
| PSVR | Preliminary Safety Validation Report |
| PME | Project Management Executive |
| PMP | Project Management Plan |
| QA | Quality Assurance |
| QAP | Quality Assurance Program |
| RA | Readiness Assessment |
| RCA | Root Cause Analysis |
| RMP | Risk Management Plan |
| ROM | Rough Order of Magnitude |
| SDS | Safety Design Strategy |
| SER | Safety Evaluation Report |
| SOP | Standard Operating Procedure |
| SRA | Schedule Risk Analysis (also synonymous with Schedule Risk Assessment) |
| TEC | Total Estimated Cost |
| TIPR | Technical Independent Project Review |
| TPC | Total Project Cost |
| TMP | Technology Maturation Plan |
| TRA | Technology Readiness Assessment |
| TRL | Technology Readiness Level |
| USC | United States Code |
| VE | Value Engineering |
| WBS | Work Breakdown Structure |

## APPENDIX A - ICR/ICE DECISION-MAKING PROCESS

This appendix provides some considerations for deciding whether an ICR or ICE should be conducted and if an ICE is selected, what Type (or method) should be performed. An actual ICE is usually a combination of Types with the predominate Type used to classify the estimate. For example, a Type V ICE will usually have less than 25% of the estimated cost developed by Types II – IV estimates.

### A. ICR or ICE DOE O 413.3B Requirement

| O413.3B Requirements for ICR/ICE | | | |
|---|---|---|---|
| CD-0 | >$750M or PME | ☑ | -- |
| CD-1 | >$100M<br>PM determines which to perform | ☑ | ☑ |
| CD-2 | >$100M | -- | ☑ |
| CD-3[8] | >$100M | | ☑ |

### B. Decision Method for selecting an ICR or ICE at CD-1.

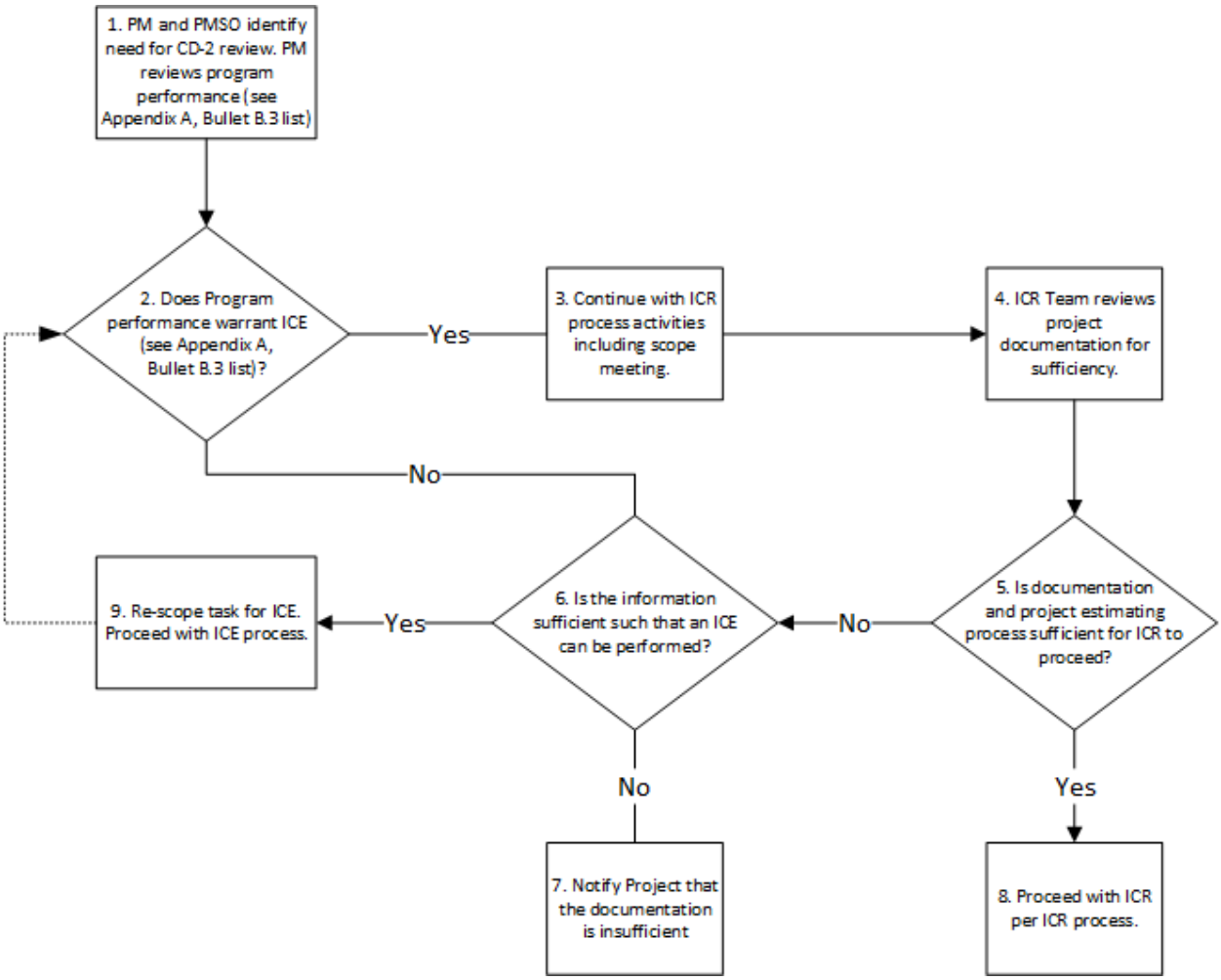
1. An ICR will normally be conducted on the CD-1 cost range and LCCE of alternatives unless an ICE is warranted, as discussed in 3 below.
2. Even if an ICR is initially prescribed during the scoping meeting, the ICR may be upgraded to an ICE during the course of the review, such as after the documentation sufficiency review. The decision flow chart below shows the process that may be followed.
3. An ICE should be performed at CD-1 if the ICR team determines that there is significant uncertainty as to the quality of the range estimate or the ability of the project/program team to develop a reasonable estimate. (See Step 2 in the flow chart below.) Factors warranting an ICE instead of an ICR at CD-1:
   a. Experience: The Program Office, Site Staff and/or Project team do not have experience in developing and managing similar size projects within the last 10 years. For example, Program Office A has not developed and managed a similar project for more than 15 years.
   b. Performance on Recent Projects: Program Office, Site Staff and/or Project team have not developed and managed similar size projects successfully (within cost, schedule, and scope baseline). Example: Site Office B's most recent similar project, just completed, required BCPs for double the cost and an extended schedule more than 1 year over the baseline approved at CD-2.
   c. Performance on Current Projects: The majority of similar sized, current projects are being performed poorly by the Site Office. Example: Site Office C's two current similar sized projects have both tracked RED in the quarterly reviews for the past year.
4. If there is any uncertainty as to whether an ICR or ICE should be conducted, the PM Lead should only plan for (authorize) the initial phase of the ICR through completion of the sufficiency review and development of the review plan. Then, once agreement is reached, the second phase of review or estimate execution can be authorized. If an ICE is

[8] An ICE is required pursuant to Public Law 2055. See Section 1 of this SOP.

determined to be necessary, then an ICE (estimate) plan should be prepared in lieu of an ICR (review) plan.

5. In any case, the CE may direct that an ICE be performed.
6. At CD-1, a typical ICE would be a Type III ICE (the majority of the costs estimated by parametric methods). A review of the project team's cost estimate would normally be conducted as part of the ICE.

**CD-1 ICR-ICE Decision Flow Chart**



## C. Decision method to select type (method) of ICE (applicable to all project milestone stages).

The type (method) of ICE may parallel the type of estimate used by the project team but use different estimating approaches, i.e., if the project team used a Type V, then the ICE may also be a Type V. If the ICE team follows the same basic approach, then the team should develop independent information such as rates and quantities or use alternate models to prevent the ICE from only being a math check of the project estimate. Alternatively, the ICE team may use other estimating methods. The specifics as to the type of ICE would normally be determined as part of developing the Estimate Plan and initial review of the project documentation. An actual ICE is usually a combination of methods, in any case. The following bullets provide some considerations on the type of ICE:

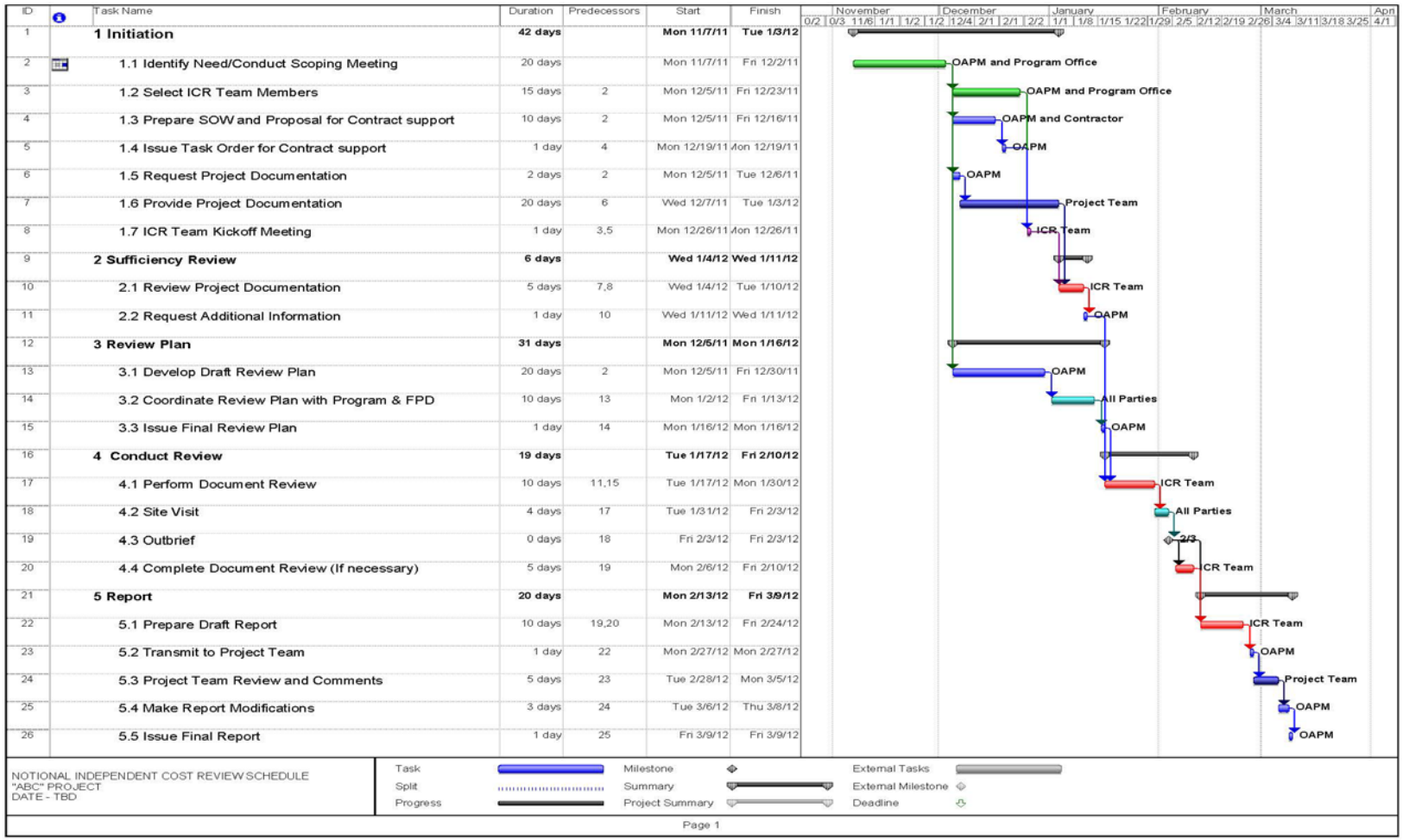
- CD-1: If an ICE is performed, a Type III is usually most appropriate; if similar project data are not available, an ICR (or Type II ICE) is more appropriate. Rarely will there be enough design details to do a Type IV or V.
- CD-2: Type III or IV is usually most appropriate for an ICE; project team should have developed a bottom-up estimate. A Type V ICE may be appropriate depending on project risk or related factors, such as technology, program experience, or quality of the project estimate. A Type IV (Sampling) ICE could include bottom-up estimates for key cost areas (about 50% of the cost) and parametric estimates or detailed reviews for other portions of the estimate.
- CD-3: Type IV or V most appropriate; depends on project risk, and performance results to date (key indicators—CPI, SPI, EAC v. Budget)

## D. Factors Affecting Performing an ICE at CD-3

DOE Order 413.3B requires an ICE at CD-3 if warranted by project risk and performance factors. Factors to be considered in a decision by PM to conduct an ICE include:

- Project risk analysis shows a significant number of project risks rated HIGH.
- The project TRLs are rated at less than a 6 for a majority of the project processes/equipment.
- Project is currently rated RED or YELLOW trending toward RED for the past two quarters. A BCP requiring CE or PME approval is being planned.

# APPENDIX B - NOTIONAL ICR SCHEDULE



| ID | Task Name | Duration | Predecessors | Start | Finish |
|---|---|---|---|---|---|
| 1 | **1 Initiation** | **42 days** | | **Mon 11/7/11** | **Tue 1/3/12** |
| 2 | 1.1 Identify Need/Conduct Scoping Meeting | 20 days | | Mon 11/7/11 | Fri 12/2/11 |
| 3 | 1.2 Select ICR Team Members | 15 days | 2 | Mon 12/5/11 | Fri 12/23/11 |
| 4 | 1.3 Prepare SOW and Proposal for Contract support | 10 days | 2 | Mon 12/5/11 | Fri 12/16/11 |
| 5 | 1.4 Issue Task Order for Contract support | 1 day | 4 | Mon 12/19/11 | Mon 12/19/11 |
| 6 | 1.5 Request Project Documentation | 2 days | 2 | Mon 12/5/11 | Tue 12/6/11 |
| 7 | 1.6 Provide Project Documentation | 20 days | 6 | Wed 12/7/11 | Tue 1/3/12 |
| 8 | 1.7 ICR Team Kickoff Meeting | 1 day | 3,5 | Mon 12/26/11 | Mon 12/26/11 |
| 9 | **2 Sufficiency Review** | **6 days** | | **Wed 1/4/12** | **Wed 1/11/12** |
| 10 | 2.1 Review Project Documentation | 5 days | 7,8 | Wed 1/4/12 | Tue 1/10/12 |
| 11 | 2.2 Request Additional Information | 1 day | 10 | Wed 1/11/12 | Wed 1/11/12 |
| 12 | **3 Review Plan** | **31 days** | | **Mon 12/5/11** | **Mon 1/16/12** |
| 13 | 3.1 Develop Draft Review Plan | 20 days | 2 | Mon 12/5/11 | Fri 12/30/11 |
| 14 | 3.2 Coordinate Review Plan with Program & FPD | 10 days | 13 | Mon 1/2/12 | Fri 1/13/12 |
| 15 | 3.3 Issue Final Review Plan | 1 day | 14 | Mon 1/16/12 | Mon 1/16/12 |
| 16 | **4 Conduct Review** | **19 days** | | **Tue 1/17/12** | **Fri 2/10/12** |
| 17 | 4.1 Perform Document Review | 10 days | 11,15 | Tue 1/17/12 | Mon 1/30/12 |
| 18 | 4.2 Site Visit | 4 days | 17 | Tue 1/31/12 | Fri 2/3/12 |
| 19 | 4.3 Outbrief | 0 days | 18 | Fri 2/3/12 | Fri 2/3/12 |
| 20 | 4.4 Complete Document Review (If necessary) | 5 days | 19 | Mon 2/6/12 | Fri 2/10/12 |
| 21 | **5 Report** | **20 days** | | **Mon 2/13/12** | **Fri 3/9/12** |
| 22 | 5.1 Prepare Draft Report | 10 days | 19,20 | Mon 2/13/12 | Fri 2/24/12 |
| 23 | 5.2 Transmit to Project Team | 1 day | 22 | Mon 2/27/12 | Mon 2/27/12 |
| 24 | 5.3 Project Team Review and Comments | 5 days | 23 | Tue 2/28/12 | Mon 3/5/12 |
| 25 | 5.4 Make Report Modifications | 3 days | 24 | Tue 3/6/12 | Thu 3/8/12 |
| 26 | 5.5 Issue Final Report | 1 day | 25 | Fri 3/9/12 | Fri 3/9/12 |

## APPENDIX C - ICR EXAMPLE LINES OF INQUIRY AND DOCUMENTATION

### CD-0 – Mission Need Rough Order of Magnitude Cost Range Review

An ICR is required for Major System Projects or as designated by the PME.

**Scope of Review:**

Evaluate reasonableness of the Total Project Cost and Schedule Ranges. Review basis of ROM cost range and provide an assessment of whether this range reasonably bounds the cost and schedule of alternatives to be analyzed in the next project phase. Review basis of schedule range and assess whether the schedule is consistent with strategic requirements for when this project is required. If appropriate, utilize historical information from completed projects with analogous scope and acquisition strategies to evaluate if the range is within the appropriate magnitude. Also, for projects closely linked to other projects, assess whether schedule results in appropriate integration. Note: If this review is not done in conjunction with a Mission Validation Independent Review, assess whether high-level requirements are sufficiently defined to identify potential alternatives (to be analyzed in the Conceptual Design phase) that are both applicable and capable of meeting project goals. Note that "reasonableness" is the judgment of the expert reviewers based on their experience. The summary checklist in Appendix G is a support tool to help communicate the review results.

**Documentation Required:**

The required documentation is prescribed by the Review Team as part of the Review Plan, as tailored to the specific project. A suggested list to be included in the Review Plan as required documentation, not all inclusive, is as follows:

| Description | CD-0 ICR | |
|---|---|---|
| | Required | Received |
| Mission Need Statement, latest draft | • | |
| Program Requirements Document (Required for NNSA) or equivalent list of functional and program requirements) | • | |
| Description of legacy program(s) | • | |
| Ground Rules & Assumptions of the estimate | • | |
| Rough order of magnitude cost ranges and schedule | • | |
| Basis of Estimate/Assumptions | • | |
| Risk Evaluation (part of Mission Need Statement or Separate) | • | |
| Tailoring Strategy (if required) | • | |

**Example Lines of Inquiry:**

The following are the normal elements and standard Lines of Inquiry (LOIs) that an ICR team should address. Elements may be added or deleted during the ICR scoping process, and LOIs should be further clarified and documented in the review plan. The most important LOIs are in **bold** text. This listing assumes that the ICR is conducted independent of any other reviews. If

this ICR is conducted with another review, the LOIs should be tailored as applicable so as not to duplicate LOIs with another review.

(1) Estimate Methods & Approach

- **Assess the method of estimation and the strengths/weaknesses of the estimates for each alternative considered. Ensure GAO's best practices in cost estimating and AOAs are encompassed.**
- **Verify that ground rules and assumptions (GR&A) are clearly identified including those related to programmatic, technical, cost and schedule basis, and economic factors.**
- Verify that the GR&A do not impose biases toward future alternative selection.
- Verify that credible and applicable tools and benchmarks including historical data have been used to develop the cost and schedule estimates (i.e., best practices such as those identified in the GAO Cost Estimating and Assessment Guide).

(2) Cost and Schedule Basis

- **Identify and assess the basis for and reasonableness of key programmatic, economic and project cost assumptions as related to the quality of estimates for each alternative considered.**
- Identify whether the estimated costs for the project are reasonable based on professional expertise, parametric estimates, historical data, etc.
- Assess basis for escalation.

(3) Risk & Uncertainty Analysis

- **Verify that reasonable and credible risks and uncertainties have been identified and documented.**
- **Verify that a reasonable qualitative (or quantitative) risk assessment has been conducted.**
- If new technology or technology applied in a new application were identified, verify that associated risks have been identified and quantified.

(4) Mission and Functional Requirements

- **Verify that appropriate and credible mission and functional requirements have been identified and documented.**
- Verify that appropriate inputs from the requirements are used for the cost and schedule ranges.
- Verify that a mission need date (CD-4) and a path to achieve it have been clearly identified.

(5) Alternatives Considered

- **Verify that appropriate alternatives were considered to ensure that breadth and depth of possible solutions are encompassed in the cost and schedule range.**

- Verify that the Project Definition Rating Index (PDRI) analysis (if performed) is consistent with an evaluation by the ICR team and at an appropriate definition level (target score 300 for pre-conceptual—see DOE Guide 413.3-12).

(6) Overall Cost and Schedule Range Estimate – Summary

- **Verify that the overall cost and schedule ranges estimated track clearly to the bases of estimate and reflect risks and uncertainty.**
- Verify that the costs and schedule are identified by project phases (design, construction) and possible key milestones.
- Verify that costs for conceptual design (next phase) been identified. Assess the reasonableness of these costs.
- Verify that life-cycle costs have been considered. Assess the reasonableness of these costs.

## CD-1 Conceptual Design Alternative Selection and Cost Range Review

For projects with a TPC>$100M, PM will conduct an ICR or an ICE as appropriate (DOE O 413.3B, Table 2.1). See Appendix A for the ICR-ICE decision process. These LOIs are for an ICR.

### Scope of Review:

Preliminary Cost and Schedule Estimates. Evaluate reasonableness of the Total Project Cost and Schedule Ranges. Review basis of the cost range and provide an assessment of whether this range reasonably bounds the cost and schedule of alternatives. Assess whether the preliminary cost and schedule estimates include cost contingency and schedule contingency appropriate for the project. Since an IPR is optional at this stage (except for HazCat 1, 2, and 3 nuclear facilities), the ICR or ICE will need to include sufficient review of all alternatives considered to ensure the reasonableness of the cost and schedule ranges. Note that while the project should have selected the preferred alternative, the ICR should look at each alternative to give the AE the full assessment if the recommended alternative is not selected.

Risk Management. Assess whether the key risks for the recommended alternative have been identified with mitigation steps defined. Assess whether the preliminary cost and schedule estimates reflect cost contingency and schedule contingency needed. The Acquisition Strategy is also an integral part of the review since the cost and schedule should reflect the selected acquisition strategy.

### Required Documentation:

The required documentation is prescribed by the Review Team as tailored to the specific project. A suggested list to be included in the Review Plan as required documentation is as follows:

| Description | CD-1 ICR | |
|---|---|---|
| | Required | Received |
| CD-0 Documents (e.g., Mission Need Statement, Approval of Mission Need) | • | |
| Conceptual Design Report (including Alternative Analysis, Hazard Analysis, site selection criteria, NEPA documentation, system functions and requirements, preliminary cost and schedule estimates) | • | |
| Project Execution Plan | • | |
| Cost and schedule basis documents, including assumptions | • | |
| Project schedule/critical path schedule | • | |
| Life-cycle cost analysis (for selected alternative; for all alternatives if significant to alternative recommendation) | • | |
| Risk Management Assessment | • | |
| Acquisition Strategy | • | |

### Lines of Inquiry:

The following are the normal elements and standard LOIs that an ICR team should address for CD-1. Elements may be added or deleted during the ICR scoping process, and LOIs should be further clarified and documented in the Review Plan. The most important LOIs are in **bold** text.

(1) Cost

- **Verify that the conceptual scope, cost, and schedule are firmly supported with sound underlying technical, economic, and programmatic basis, assumptions, and front-end planning.**
- Assess the project PDRI analysis (if performed)—a best practice— and verify that it is consistent with an evaluation by the ICR team and at an appropriate definition level (target score 600 for conceptual—see DOE Guide 413.3-12).
- Assess that credible cost and schedule ranges have been developed and supported by applicable tools and benchmarks (i.e., best practices as identified in the GAO Cost Estimating and Assessment Guide).
- Ensure that there is appropriate cost and schedule integration. Refer to expectations set forth in DOE EV Interpretation Handbook, when appropriate.
- **Verify that the conceptual design is mature enough to support definition and development of credible current TRL definition, WBS elements development and contingency/MR planning, and to support the resolution of constructability issues.**
- Assess the preliminary funding profile identifying funds for design and construction, including the possible use of PED funding.
- **Assess the method of estimation and the strengths/weaknesses of the estimates. Ensure GAO's best practices in cost estimating are followed.**
- Identify and assess the basis for and reasonableness of key programmatic, economic and project cost assumptions as related to the quality of estimates and risk management planning and contingency requirements.
- Assess the amount of and basis for escalation.
- Identify whether the estimated costs for the project are reasonable based on professional expertise, parametric estimates, historical data, etc.
- Verify that the cost value of schedule contingency is included in the cost range.
- Assess the basis and reasonableness of the LCCEs for the alternatives considered and the selected alternative. Complete **LCCE table** below.

**Life Cycle Cost Estimate – Alternative x**

| Cost Element | CD-1 Low Range $ | CD-1 High Range $ |
|---|---|---|
| Design | | |
| Construction | | |
| Startup-Testing-Commissioning | | |
| Operations (over _____ years) | | |
| Shutdown, Dismantling, Decommissioning | | |
| **Total Life Cycle Cost** | | |

Complete a table for each alternative (identify the recommended alternative). Refer to Section 4.1.2 of this SOP for further guidance concerning LCCEs – in some instances, there will not be a LCCE for each alternative.

(2) Schedule

- **Assess the method of schedule estimation and the strengths/weaknesses of estimates.**
- **Ensure schedule health integrity. Refer to GAO Schedule Assessment Guide (GAO-16-89G), NDIA PASEG, and DOE EV IH, as appropriate for schedule metrics and thresholds. Ensure constraints and other artifacts within schedule do not artificially impact the overall schedule range.**
- **Identify and assess the basis for and reasonableness (and consistency with cost estimate) of key programmatic, economic and project schedule assumptions as related to the quality of estimates and risk management planning and contingency requirements.**
- Identify whether the estimated schedule range for the project is reasonable based on professional expertise, parametric estimates, historical data, etc.

(3) Scope

- Assess if the new technology or technology applied in a new application is mature enough and validated through appropriate tools (i.e. comparison with ICR team's Technology Readiness Assessment).
- Verify that design review comments, integration issues (with Operations and other projects) and constructability constraints have been sufficiently addressed.
- **Assess whether the conceptual WBS and WBS dictionary incorporate all project work scope, and that the defined work scope and system requirements are derived from and consistent with the approved Mission Need and include a clear definition of responsibility for execution of each or the defined portions of work.**
- Assess if the WBS represents a reasonable breakdown of the project work scope and if it is effective for internal management control and reporting. Refer to the DOE EV IH, as appropriate.
- **Identify and assess the basis for and reasonableness of key programmatic, economic, and project scope assumptions as related to the quality and completeness of the WBS, technical and design requirements, and risk management planning and contingency requirements.**
- Identify all underlying technical assumptions and assess whether they are sound and/or appropriately addressed within the Risk Management Plan and adequately supported with contingency, particularly for new technologies that have never been developed and/or prototyped within the proposed environment.
- Assess whether it is reasonable to divide the work scope presented into smaller, discrete (completed and useable) projects to reduce risk. If applicable, identify the basis for managing such discrete projects in an integrated program.)
- Confirm that a Program Requirements Document (PRD) exists (required for NNSA) and that project planning reflects the PRD (or equivalent mission programmatic functional and technical requirements for non-NNSA projects).

(4) Risk Management

- Refer to DOE G 413.3-7A, Risk Management Guide, for risk management definitions, practices, etc**.**
- **Verify that risks have been identified for the selected alternative and that contingency analyses have been conducted and documented in Risk Management Plan(s) by DOE and its contractor.**
- **Assess adequacy and completeness of both DOE and contractor risk management planning including the method(s) used to identify risks, and whether a reasonably complete list of potential risks was developed for analysis.**
- Determine whether appropriate risk handling and mitigation actions, including accepted risks and residual risks, have been identified.
- Identify and assess cost and schedule management reserve (MR) and contingency (both contractor and DOE).
- Ensure MR and contingency allowances are tied to risk assessments.
- Assess the adequacy of a separate estimate uncertainty analysis included in the determination of MR and contingency?
- Assess adequacy of the qualitative analysis and rating (high, medium, or low) of current risks (including site specific factors such as availability of contractors) for probability of occurrence and for consequence of occurrence.
- Evaluate the extent and adequacy of quantitative risk analysis.
- Evaluate the adequacy of the management control process for risk status/updating.
- Ensure the project team is aware of risk management tools.
- Ensure the project team fully understands the distinction between MR and Contingency.

(5) Management Planning and Acquisition Strategy

- **Review the Acquisition Strategy/Plan to determine if a strategy/plan for successful execution of the project is established, if the project is being executed in accordance with the strategy/plan, and it is consistent with other project documentation.**
- Verify that an appropriate level of project management planning has been performed to ensure project team can complete the next phase of the project.
- Verify that an FPD been assigned consistent with the requirements of DOE Order 361.1B.
- Assess the adequacy of a fully integrated (Government and contractor) IPT with appropriate disciplines to support the design activities.
- Assess that the methods and approach planned for project execution appropriately is documented in the PEP.
- **Verify that the selected alternative has been adequately justified on the basis of cost, schedule, and scope.**
- **Review the AOA to determine if the GAO best practices as identified in GAO 16-22 were used.**

## ICR for Other Project Phases (e.g., CD-2 or CD-3)

Below is a discussion of required documentation, as well as the Lines of Inquiry (LOIs), that will generally form the scope of a CD-2 and/or CD-3 ICR. Additional elements or LOIs beyond those presented in this document may be based on unique aspects of the project being reviewed and decisions reached during the scoping meeting. Both the ICR scope and required documentation may vary depending on the type of project and any tailoring that may be applied to the ICR. For projects with a TPC > $100 million, DOE O 413.3B requires an ICE at CD-2. Federal Law (see Section 1 of this SOP) requires an ICE at CD-3 for projects with a TPC > $100 million, and an ICE or ICR might be warranted at any post-CD2 stage in project execution depending on performance and risk factors. Refer to Section 5.2.3 of this SOP, which discusses requirements for an ICE at CD-3. As noted in this section, in some cases only a Type II ICE may be warranted at CD-3, in which case the following guidance would be applicable because a Type II ICE is essentially an ICR.

### Required Documentation for the CD-2 and CD-3 ICR:

In general, the following documents (or equivalents) are normally required for a CD-2 and CD-3 ICRs. Other material may be requested by PM and the ICR team to ensure that a complete and accurate review is performed.

| Description | CD-2 ICR | | CD-3 ICR | |
|---|---|---|---|---|
| | Required | Received | Required | Received |
| CD-0 Documents (e.g., Mission Need Statement, Approval of Mission Need) | • | | • | |
| CD-1 Documents (e.g., Approval of Alternative Selection and Cost Range, Conceptual Design Report) | • | | • | |
| CD-2 Documents (e.g., Approval of Performance Baseline) | | | • | |
| Work Breakdown Structure (WBS) and WBS Dictionary | • | | • | |
| Detailed Resource Loaded Schedule (RLS) | • | | • | |
| Summary project or milestone schedule | • | | • | |
| Detailed Cost and Schedule Estimates, including Basis of Cost Estimate, Basis of Schedule Estimate, and all project-basis and assumptions | • | | • | |
| Detailed bottom-up Cost and Schedule Estimates based on the completed design (includes bases of estimate and assumptions) | | | • | |
| Program Requirements Document (or equivalent) | • | | • | |
| Cost estimate backup, including vendor quotations, parametric formulas, engineering calculation, historical costs, and the like | • | | • | |
| Critical Path and Near-Critical Path Schedules | • | | • | |
| System Functions and Requirements Document (also referred to as the "Design-to" requirements or Design Criteria) | • | | • | |
| Results of and Responses to Project Design Reviews and Technical Independent Project Reviews | • | | • | |
| Design Review Report and comments resolution | • | | • | |
| Constructability Reviews | | | • | |
| Project Execution/Management Plans | • | | • | |
| Evidence and results of constructability reviews of the design | • | | • | |
| Federal and contractor organization chart and staffing plans | • | | • | |
| National Environmental Policy Act documentation identifying EIS and/or permit requirements and status | • | | • | |
| Hazards Analysis Report | • | | • | |

| Description | CD-2 ICR | | CD-3 ICR | |
|---|---|---|---|---|
| | Required | Received | Required | Received |
| DNFSB or NRC open issues | • | | • | |
| Documentation of DOE and DFNSB (or NRC) endorsement of design and operational safety basis. | • | | • | |
| Start-up Testing and Turnover Planning documents and other operations readiness plans (as appropriate) | • | | • | |
| Summary of Preliminary Safety Design Report (Hazard Category 1, 2, or 3 nuclear facilities) identifying significant project risks and safety features | • | | • | |
| Preliminary Security Vulnerability Assessment Report | • | | • | |
| Risk Management Plan (RMP) | • | | • | |
| Risk Analysis Report, including probabilistic (e.g. Monte Carlo) results for both contractor and federal risks (if not contained in RMP) | • | | • | |
| Updated Risk Management Plan and Risk Analysis Report | | | • | |
| Acquisition Strategy/Acquisition Plan | • | | • | |
| Value Management/Engineering Report | • | | • | |
| Pending contract modifications/Requests for Equitable Adjustment | • | | • | |
| All Baseline Change Proposal and disposition documentation | | | • | |
| Project Data Sheets | • | | • | |
| Project Funding Profile (Program budget/planning office should identify if this profile is within the Program target budget profile) | • | | • | |
| Regulatory agreement documentation (project commitments, milestones, deliverables, dates) | • | | • | |

**Example Lines of Inquiry**

The most important LOIs are in **bold** text

(1) Cost and Basis of Cost

Note. The ICR team should evaluate the entire cost estimate and cost basis. Selected WBS elements may be reviewed in more detail (e.g., pick WBS elements that comprise at least 75% of the total cost)

- Verify that the cost is firmly supported with sound underlying technical, economic, and programmatic bases, assumptions, and front-end planning (i.e., PDRI—Project PDRI analysis required for CD-2, recommended for CD-3).
- Verify that credible and sufficiently complete cost and schedule baselines have been developed and supported by applicable tools and benchmarks (i.e., best practices such as those identified in the GAO Cost Estimating and Assessment Guide).
- Verify that the funding profile remains intact and is still viable.
- **Assess the method of estimation and the strengths/weaknesses of the estimates for each WBS element reviewed. Assess the credibility of the cost risk distribution for each WBS element (cost uncertainty analysis). Assess completeness of estimate work packages and backup information (e.g., vendor quotes for equipment; unit rates, overhead rates) Ensure GAO's best practices in cost estimating are encompassed, including sensitivity analyses.**

- **Identify and assess the basis for and reasonableness of key programmatic, economic and project cost assumptions as related to the quality of estimates and risk management planning and contingency requirements.**
  - Ensure that there is appropriate cost and schedule integration. Refer to expectations set forth in DOE EV IH, when appropriate.
- Assess the amount of and basis for escalation.
- Assess reasonableness of resource loading, including what resources are loaded.
- Identify whether the estimated costs for the project are reasonable based on professional expertise, parametric estimates, historical data, etc.
- Verify that the cost value of schedule contingency is included in the TPC
- Verify findings from previous reviews been adjudicated, and the corrective actions are implemented.
- Provide a completed project cost and funding profile table (provided below). Completed project cost profile tables are expected in all ICR reports. Additionally, the ICR team should include a milestone schedule graphic to accompany the cost profile table.
- Review and provide the basis for the Funding Profile (e.g., latest Project Data Sheet).
- Compare the annual budget with the cost requirements, and provide an assessment of whether the costs and budget are reasonably linked and can withstand normal budget turbulence during fiscal year transition periods (e.g., continuing resolutions, new start restrictions, etc.)
- Identify any significant disconnects between the performance baseline requirements and budget/out-year funding. Determine the reasonableness of the Budget Authority versus Budget Obligation profiles and assess the affordability of the project within the Program's budget profile.
- Validate the funding profile remains viable and intact throughout the project lifetime.
- Include budget/funding information in the following project summary cost profile tables and the detailed cost table.

## Project Cost/Funding Profile Summary Tables

**Table 1. Budget Cost Breakdown – Funding Source Specific (future and sunk)**

| Description | <FY15 | FY16 | FY17 | FY18 | FY19 | FY20 | FY21 | Total |
|---|---|---|---|---|---|---|---|---|
| PED | | | | | | | | |
| Construction | | | | | | | | |
| TEC | | | | | | | | |
| OPC | | | | | | | | |
| TPC | | | | | | | | |

Note: above values include MR/Contingency

**Table 2. Project Data Sheet Cost Breakdown – Funding Source Specific**

| Description | Costs to Date (as of _____) | Costs to Go | Total |
|---|---|---|---|
| PED | | | |
| Construction | | | |
| TEC | | | |
| OPC | | | |
| TPC | | | |

**Table 3. Earned Value Management System Breakdown- Fund Source Neutral**

| Description | <FY 15 | FY 16 | FY 17 | FY 18 | FY 19 | FY 20 | FY 21 | Total |
|---|---|---|---|---|---|---|---|---|
| *Contract Budget Base | | | | | | | | |
| Fee/Profit | | | | | | | | |
| Other DOE Direct Costs | | | | | | | | |
| Contingency | | | | | | | | |
| Performance baseline (TPC) | | | | | | | | |

** Contract Budget Base is inclusive of the Performance Measurement Baseline, any Undistributed Budget, and, Management Reserve.*

**Table 4. Earned Value Management System Breakdown- Fund Source Neutral**

| Description | Costs to Date (as of _____) | Costs to Go | Total |
|---|---|---|---|
| PMB | | | |
| Undistributed Budget | | | |
| MR | | | |
| *Contract Budget Base | | | |
| Fee/Profit | | | |
| Other DOE Direct Costs | | | |
| Contingency | | | |
| Performance baseline (TPC) | | | |

** Contract Budget Base is inclusive of the Performance Measurement Baseline, any Undistributed Budget, and, Management Reserve.*

**Table 5. Funding Constrained TPC versus Unconstrained TPC**

| Description | <FY 15 | FY 16 | FY 17 | FY 18 | FY 19 | FY 20 | FY 21 | Total |
|---|---|---|---|---|---|---|---|---|
| TPC (as funded, constrained) | | | | | | | | |
| TPC (if unconstrained funding available) | | | | | | | | |
| Difference | | | | | | | | |

**Table 6. CD-4 Date – Funding Constrained versus Unconstrained**

| Element | Date (or Months) |
|---|---|
| Constrained (as currently planned) CD-4 date) | |
| Unconstrained CD-4 date (if funding available) | |
| Difference in Months | |

**Table 7. Life Cycle Cost Estimate - Updated**

| Cost Element | Original CD-1 | Updated |
|---|---|---|
| Design | | |
| Construction | | |
| Startup-Testing-Commissioning | | |
| Operations (over _____ years) | | |
| Shutdown, Dismantling, Decommissioning | | |
| **Total Life Cycle Cost** | | |

**SAMPLE PROJECT COST PROFILE TABLE**

## Project Cost Profiles

Project Number(s):

Project Title:

Date updated:

TPC or range ($K):

| Cost Element | FY PY-1 FY 2014 | FY PY-2 FY 2015 | Total Prior Years | FY BY-1 FY 2016 | FYBY-2 FY 2017 | FYBY-3 FY 2018 | FYBY-4 FY 2019 | Total Current Estimate |
|---|---|---|---|---|---|---|---|---|
| **Critical Decision (approvals)** | CD-0 | CD-1 | | CD-2 | CD-3 | | CD-4 | |
| **Total Estimated Cost (TEC)** | | | | | | | | |
| Design (PED) | | | | | | | | |
| Design | | | | | | | | |
| Contingency | | | | | | | | |
| Total, PED | | | | | | | | |
| Appropriations | | | | | | | | |
| Obligations | | | | | | | | |
| Costs | | | | | | | | |

Construction (Post CD-2)

Site Preparation

Equipment

All Other Construction

Contingency

Total, Construction

Appropriations

Obligations

Costs

**Total, TEC (Post CD-2)**

| Cost Element (page 2) | FY PY-1 FY 2014 | FY PY-2 FY 2015 | Total Prior Years | FY BY-1 FY 2016 | FYBY-2 FY 2017 | FYBY-3 FY 2018 | FYBY-4 FY 2019 | Total Current Estimate |
|---|---|---|---|---|---|---|---|---|
| **Other Project Cost (OPC)** | | | | | | | | |
| OPC except D&D | | | | | | | | |
| Conceptual Planning | | | | | | | | |
| Conceptual Design | | | | | | | | |
| Start-Up | | | | | | | | |
| Contingency | | | | | | | | |

| | |
|---|---|
| Total, OPC except D&D | |
| Appropriations | |
| Obligations | |
| Costs | |
| | |
| D&D (Post CD-2) | |
| D&D | |
| Contingency | |
| Total, D&D | |
| Appropriations | |
| Obligations | |
| Costs | |
| | |
| **Total, OPC** | |
| Total, Contingency | |
| Appropriations | |
| Obligations | |
| Costs | |
| | |
| **Total, TPC (Post CD-2)** | |

**Additional Cost LOIs for ICR in support of CD-3**

(1) Cost

- **Identify the source and reason for any proposed substantive changes to the RLS since CD-2 relative to its consistency with the approved performance baseline (TPC, CD-4 completion schedule). Assess the basis and justification for these changes.**
- **For selected WBS elements (typically, those constituting significant cost, schedule and/or risk), summarize the detailed basis for the cost or schedule estimate. Identify strengths/weaknesses of the estimates reviewed.**
- Identify and assess any changes since CD-2 to the basis for and reasonableness of key programmatic, economic, and project cost assumptions as related to the quality of estimates, and risk management planning and contingency requirements.
  - Ensure that there is appropriate cost and schedule integration. Refer to expectations set forth in DOE EV Interpretation Handbook, when appropriate.
- Identify the amount of, and basis for, escalation. Assess the basis and justification for any changes since CD 2.
- Assess basis of resource loading, including what resources are loaded. Determine if resource requirements factor in project performance since CD-2 or performance of other similar projects in execution.
- Provide updated project cost profile tables (detailed and summary).
- Based on the project cost profile table, develop summary baseline cost tables (i.e., PED, TEC, OPC, TPC, Contract Budget Base, Fee, DOE Direct Costs, and Contingency) and schedule tables of the proposed milestones (i.e., Critical Decision dates and other significant or critical project dates) for the ICR report. Identify and assess the basis and justification for any changes to the TPC and CD-4 schedule since CD-2.

(2) Schedule

- **Evaluate the reasonableness of the overall project schedule, including resource loading and what resources are loaded.**
- **Verify that the schedule contains all of the discrete work required to complete the CD-4.**
- **Verify that the schedule contains complete WBS and OBS structures.**
- For the selected WBS elements, summarize the detailed basis of schedule estimate.
- **Assess the method of estimation and the strengths/weaknesses of estimates.**
- Identify and assess the basis for and reasonableness of key programmatic, economic and project schedule assumptions as related to the quality of estimates for each WBS element, and risk management planning and contingency requirements.
- Determine if schedule contingency is derived quantitatively and if the calculated duration is placed between the end of the last project critical path activity and the “Submit Request for CD-4” milestone.
- Identify whether the estimated schedule for the project is reasonable based on professional expertise, parametric estimates, historical data, etc.

- Include CD milestone data on the project cost profile table referenced above and include summary baseline schedule tables of the proposed milestones (i.e., CD dates and other significant or critical project dates) in the EIR report.
- Assess whether the Critical Path is reasonably defined and technically reasonable. Assess whether the Critical Path reflects an integrated schedule and schedule durations are reasonable. For an ICR at CD-3, identify any changes since CD-2.
  - Assess whether the schedule fidelity in the near term is reasonable. Refer to the GAO Schedule Assessment Guide (GAO-16-89G), the NDIA PASEG and the DOE EV IH, as appropriate.
- Determine if there is a clearly defined critical path leading to submission of the CD-4 request.

(3) Scope

Note: If the ICR is not performed in conjunction with an IPR or EIR, the project scope definition should be reviewed to ensure adequate basis for cost and schedule estimates. If part of an IPR/EIR, these elements (and others) are covered in the review.

- Verify that the scope is firmly supported with sound underlying technical, economic, and programmatic bases, assumptions, and front-end planning (i.e., PDRI).
- Verify that the design has matured to the appropriate degree and been validated through appropriate and credible processes.
- **Assess whether the CD-4 (project completion) activities and requirements and project key performance parameters (KPPs) are clearly defined.**
- Verify that the new technology or technology applied in a new application is mature enough and validated through appropriate tools (i.e. comparison with IPR team's Technology Readiness Assessment).
- Verify that the design review comments, integration issues (with Operations and other projects) and constructability constraints have been sufficiently addressed.
- **Verify that the Basis of Scope (As defined in the Work Breakdown Structure, System Functions and Requirements for CD-2, as defined in the Work Breakdown Structure, final Drawings and Specifications, Final Design Functions and Requirements, and Final Design Criteria for CD-2), is adequately identified and documented..**
- **Assess whether the WBS and WBS dictionary incorporate all project work scope, and that the defined work scope and system requirements are derived from and consistent with the approved Mission Need and include a clear definition of responsibility for execution of each or the defined portions of work.**
- Assess if the WBS represents a reasonable breakdown of the project work scope and if it is effective for internal management control and reporting.
- **Identify and assess the basis for and reasonableness of key programmatic, economic, and project scope assumptions as related to the quality and completeness of the WBS, technical and design requirements, and risk management planning and contingency requirements.**
- Identify all underlying technical assumptions and assess whether they are sound and/or appropriately addressed within the Risk Management Plan and adequately supported with funded contingency, particularly for new technologies that have never been developed and/or prototyped within the proposed environment.

- Assess whether it is reasonable to divide the work scope presented into smaller, discrete (completed and useable) projects to reduce risk. If applicable, identify the basis for managing such discrete projects in an integrated program.
- Confirm that a Program Requirements Document (PRD) (required for NNSA or equivalent technical and functional requirements for other programs) exists and that project planning reflects the project requirements.

(4) Risk

- Verify that relevant and comprehensive risk and contingency analyses have been conducted and Risk Management Plans have been prepared by DOE and its contractor.
- Assess the approach used to identify and quantify project risks and assess the adequacy of this approach, as well ensure best practices are incorporated.
- **Assess adequacy and completeness of both DOE and contractor risk management planning including the method(s) used to identify risks, and whether a reasonably complete list of potential risks was developed for analysis.**
- **Assess whether all appropriate risk handling and mitigation actions, including accepted risks and residual risks, have been incorporated into the project work plans, cost and schedule.**
- **Identify and assess cost and schedule contingency (both contractor and DOE). Provide an assessment of whether the analysis for and basis of contingency is reasonable for this type of project and its associated risks.**
- Ensure contingency accounts for estimate uncertainty, which is directly tied to design maturity and the estimating methodologies used. Estimate uncertainty should be a separate analysis based on the WBS elements and not risk elements (a best practice, see DOE G 413.3-21 and GAO Estimating and Assessment Guide).
- Assess whether the project team used the available risk management tools.
- Assess derivation and adequacy of Management Reserve (MR) and Contingency.
- Identify and assess any substantive changes to the Federal and contractor risk and contingency management plans or processes since CD-2.
- Assess whether the risk assessment and management plan have been updated, as appropriate, to address any new risks identified in final design and evaluate the adequacy of the management control process for risk status/updating.
- Assess MR/contingency drawdown and utilization history for reasonableness, and determine if sufficient contingency remains.
- Verify that the schedule margin identified is consistent with the schedule risk.

(5) Management team and Acquisition Strategy/Plan

- **Review the Acquisition Strategy/Plan to determine if a strategy/plan for successful execution of the project is established, if the project is being executed in accordance with the strategy/plan, and it is consistent with other project documentation.**

- Verify that an appropriate level of project management planning has been performed to ensure project team can complete the next phase of the project.
- Verify that an FPD been has been assigned consistent with the requirements of O 361.1B.
- Assess the adequacy of a fully integrated (Government and contractor) IPT with appropriate disciplines to support the design activities.
- Verify that the methods and approach planned for project execution appropriately documented in the PEP.

## APPENDIX D - ICR CHECKLISTS

This appendix provides sample check lists to be used during the ICR process to assist in:

- Sufficiency review of the estimate (initial acceptance review)
- Reasonableness review of the estimate (detailed review).

The check lists should help the ICR Team focus on areas of weakness that need more detailed review and to communicate the review results with others. These checklists are not intended to be the total review activity, only part of it and should be tailored to fit the specific project and the review being conducted. The checklists are provided for CD-0 and CD-1. If an ICR is performed at other project stages, checklist should be tailored to suit the project and stage. A sample summary score sheet for the reasonableness review is provided at the end of the appendix. The summary score sheet should be used to highlight the status and communicate results.

**CD-0 – Mission Need Rough Order of Magnitude Cost Range Review**
**Sufficiency (Acceptance) Review Checklist**

| Sufficiency Review Checklist | | | | |
|---|---|---|---|---|
| The sufficiency review is the initial acceptance review of the documentation received to allow the team to determine if sufficient information is available to perform the detailed review. | | | | |
| The review team members should answer the questions as noted. Provide comments as appropriate to clarify the answer. Yes is good (complete, sufficient, etc.); no is not. | | | | |
| **Questions** | **Yes** | **No** | **N/A** | **Comments** |
| **Documentation** | | | | |
| Was all the documentation received per the requested list? | | | | |
| If documents are missing, are they insignificant to the estimate review or are equivalent documents available? | | | | |
| **Completeness** | | | | |
| Is a basis of estimate document or equivalent included? | | | | |
| Are assumptions identified? | | | | |
| Are mission need (functional and programmatic) requirements identified? | | | | |
| Does the estimate approach appear logical? | | | | |
| Is a range of potential alternatives described for purpose of defining the cost and schedule range? | | | | |
| Is the overall rough order of magnitude construction cost and schedule identified encompassing the alternatives? | | | | |
| Is there a life-cycle cost analysis for the range of alternatives? | | | | |
| Is the mission need date identified? | | | | |
| Are risks and uncertainties described and qualified or quantified? | | | | |
| Are costs for the next phase (conceptual design) and a funding source identified? | | | | |
| Summary (Ready to go or not?) | | | | |

## Sample Reasonableness Review Summary Checklist (CD-0)

| Reasonableness Review Checklist | | | | |
|---|---|---|---|---|
| The reasonableness review summarizes the lines of inquiry and review of the documentation for the overall reasonableness of the estimate. Specific findings and recommendations are captured in the ICR report | | | | |
| The review team members should answer the questions as noted. Provide comments as appropriate to clarify the answer. Yes is good (reasonable or acceptable); No is not. | | | | |
| **Questions** | **Yes** | **No** | **N/A** | **Comments** |
| **Documentation** | | | | |
| If additional documentation was requested, was it received in time to support the review? | | | | |
| Is the documentation package complete and usable as a basis for the estimate? | | | | |
| **Relevance** | | | | |
| Are the approaches used in the estimate appropriate for the information available? | | | | |
| Are the assumptions appropriate for the project? | | | | |
| Are appropriate rationales documented for items like engineering judgment? | | | | |
| Is historical information appropriately used for the estimate? | | | | |
| Are the mathematical calculations correct? | | | | |
| **Consistency** | | | | |
| Are the methods used for evaluating each alternative appropriate and consistent? | | | | |
| Is the estimate consistent with the technology maturity? | | | | |
| **Completeness** | | | | |
| Is a full range of possible alternatives identified? | | | | |
| Does the estimate (cost & schedule) include the full range of alternatives considered (including life cycle costs)? | | | | |
| Are funding needs and sources identified? | | | | |
| **Risk and Uncertainty** | | | | |
| Are risks and uncertainties appropriately identified? | | | | |
| Are risks and uncertainties analyzed? | | | | |
| Are both cost and schedule risk impacts identified? | | | | |
| **Reasonableness** | | | | |
| Is the overall cost range estimate reasonable? | | | | |
| Is the overall schedule duration range estimate reasonable? | | | | |

## CD-1 Conceptual Design Alternative Selection and Cost Range Review
## Sufficiency (Acceptance) Review Checklist

| Sufficiency Review Checklist | | | | |
|---|---|---|---|---|
| The sufficiency review is the initial acceptance review of the documentation received to allow the team to determine if sufficient information is available to perform the detailed review. | | | | |
| The review team members should answer the questions as noted. Provide comments as appropriate to clarify the answer. Yes is good (complete, sufficient, etc.); no is not. | | | | |
| **Questions** | **Yes** | **No** | **N/A** | **Comments** |
| **Documentation** | | | | |
| Was all the documentation received per the requested list? | | | | |
| If documents are missing, are they insignificant to the estimate review or are equivalent documents available? | | | | |
| **Completeness** | | | | |
| Is a basis of estimate document or equivalent included? | | | | |
| Are assumptions identified? | | | | |
| Are functional and programmatic requirements identified? | | | | |
| Does the estimate approach appear logical? | | | | |
| Is a range of potential alternatives described for purpose of defining the cost and schedule range? | | | | |
| Is the overall construction cost and schedule range identified for the proposed alternative? | | | | |
| Is there a life-cycle cost analysis for the selected alternative? | | | | |
| Are there life-cycle cost estimates for all alternatives, if cost is a significant factor in determining the selected alternative? | | | | |
| Are risks and uncertainties described and qualified or quantified? | | | | |
| Are costs for the next phase (preliminary design) and a funding source identified? | | | | |

Note: If the sufficiency review is unsatisfactory and improved documentation is not readily available (or if the methods and approach are questionable), the ICR may be changed to an ICE with approval of PM Lead. See Appendix C for the ICR-ICE decision process.

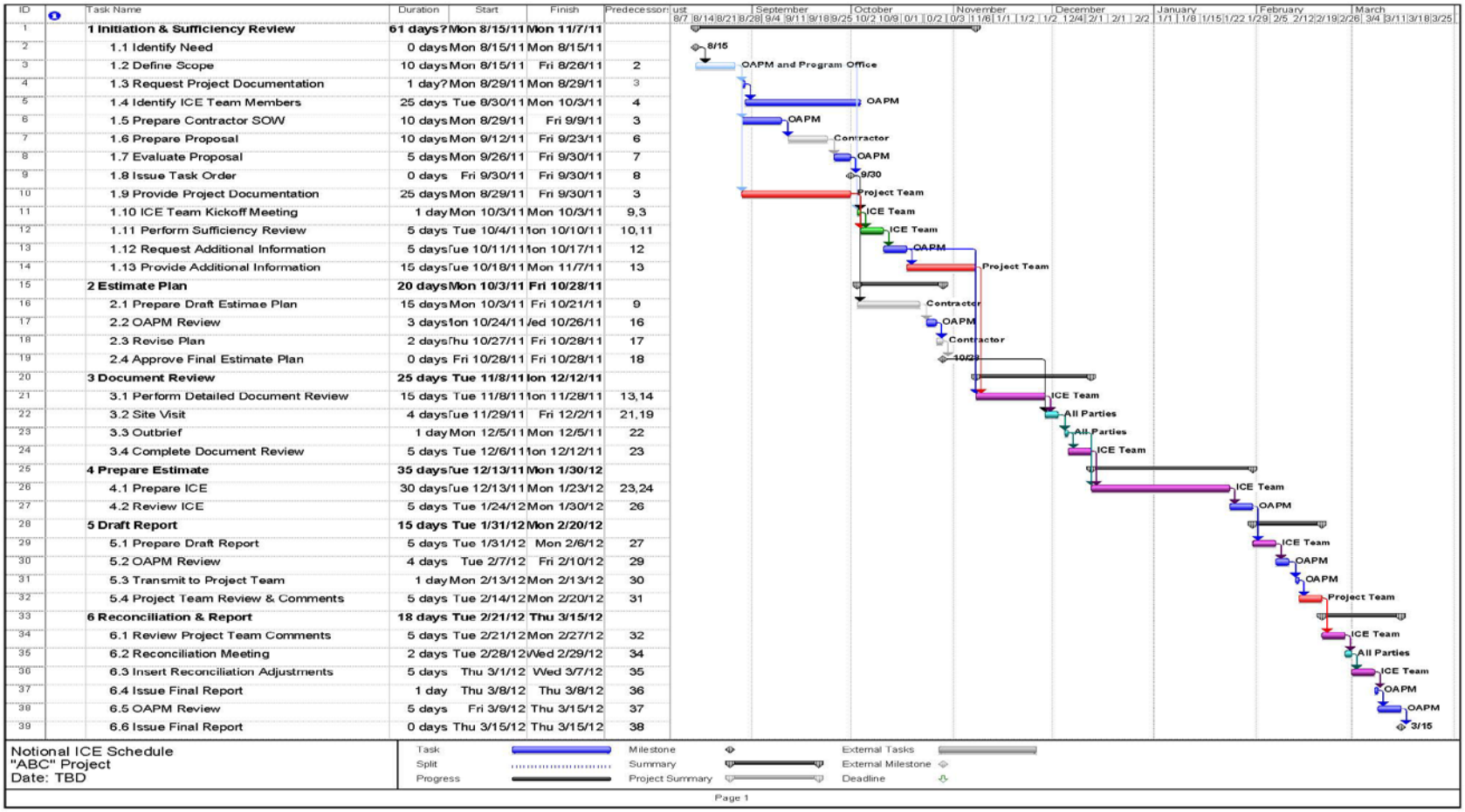
## Sample Reasonableness Review Summary Checklist (CD-1)

| Reasonableness Review Checklist | | | | |
|---|---|---|---|---|
| The reasonableness review summarizes the lines of inquiry and review of the documentation for the overall reasonableness of the estimate. Specific findings and recommendations are captured in the ICR report | | | | |
| The review team members should answer the questions as noted. Provide comments as appropriate to clarify the answer. Yes is good (reasonable or acceptable); no is not. | | | | |
| **Questions** | **Yes** | **No** | **N/A** | **Comments** |
| **Documentation** | | | | |
| If additional documentation was requested, was it received in time to support the review? | | | | |
| Is the documentation package complete and usable as a basis for the estimate? | | | | |
| **Relevance** | | | | |
| Are the approaches used in the estimate appropriate for the information available? | | | | |
| Are the assumptions appropriate for the project? | | | | |
| Are appropriate rationales documented for items like engineering judgment? | | | | |
| Is historical information appropriately used for the estimate? | | | | |
| Are the mathematical calculations correct? | | | | |
| **Consistency** | | | | |
| Are the methods used for evaluating each alternative appropriate and consistent? | | | | |
| Is the estimate consistent with the technology maturity? | | | | |
| **Completeness** | | | | |
| Was an appropriate range of possible alternatives identified? | | | | |
| Does the estimate (cost & schedule) include the various alternatives? | | | | |
| Are funding needs and sources identified? | | | | |
| Are life cycle costs evaluated for each alternative (if cost is a significant factor in the alternative selection)? | | | | |
| Is the backup information (estimate basis) complete for each alternative? | | | | |
| **Risk and Uncertainty** | | | | |
| Are risks and uncertainties appropriately identified? | | | | |
| Are risks and uncertainties analyzed using appropriate quantitative statistical techniques? | | | | |
| Are both cost and schedule risk impacts identified? | | | | |
| **Reasonableness** | | | | |
| Is the overall cost range estimate for the recommended alternative reasonable? | | | | |
| Is the overall schedule duration range estimate reasonable? | | | | |

## Sample Summary Form

| Reasonableness Review Summary Form | | | | | |
|---|---|---|---|---|---|
| **Evaluation Score** | **Yes** | | **No** | | **Major Issue Description** |
| Appropriate Documentation Received & Usable | | | | | |
| Estimate Relevant | | | | | |
| Estimate Consistent | | | | | |
| Risk & Uncertainty Adequately Addressed | | | | | |
| Overall Estimate Reasonable | | | | | |

# APPENDIX E - NOTIONAL ICE SCHEDULE



| ID | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|
| 1 | **1 Initiation & Sufficiency Review** | **61 days?** | **Mon 8/15/11** | **Mon 11/7/11** | |
| 2 | 1.1 Identify Need | 0 days | Mon 8/15/11 | Mon 8/15/11 | |
| 3 | 1.2 Define Scope | 10 days | Mon 8/15/11 | Fri 8/26/11 | 2 |
| 4 | 1.3 Request Project Documentation | 1 day? | Mon 8/29/11 | Mon 8/29/11 | 3 |
| 5 | 1.4 Identify ICE Team Members | 25 days | Tue 8/30/11 | Mon 10/3/11 | 4 |
| 6 | 1.5 Prepare Contractor SOW | 10 days | Mon 8/29/11 | Fri 9/9/11 | 3 |
| 7 | 1.6 Prepare Proposal | 10 days | Mon 9/12/11 | Fri 9/23/11 | 6 |
| 8 | 1.7 Evaluate Proposal | 5 days | Mon 9/26/11 | Fri 9/30/11 | 7 |
| 9 | 1.8 Issue Task Order | 0 days | Fri 9/30/11 | Fri 9/30/11 | 8 |
| 10 | 1.9 Provide Project Documentation | 25 days | Mon 8/29/11 | Fri 9/30/11 | 3 |
| 11 | 1.10 ICE Team Kickoff Meeting | 1 day | Mon 10/3/11 | Mon 10/3/11 | 9,3 |
| 12 | 1.11 Perform Sufficiency Review | 5 days | Tue 10/4/11 | Mon 10/10/11 | 10,11 |
| 13 | 1.12 Request Additional Information | 5 days | Tue 10/11/11 | Mon 10/17/11 | 12 |
| 14 | 1.13 Provide Additional Information | 15 days | Tue 10/18/11 | Mon 11/7/11 | 13 |
| 15 | **2 Estimate Plan** | **20 days** | **Mon 10/3/11** | **Fri 10/28/11** | |
| 16 | 2.1 Prepare Draft Estimae Plan | 15 days | Mon 10/3/11 | Fri 10/21/11 | 9 |
| 17 | 2.2 OAPM Review | 3 days | Mon 10/24/11 | Wed 10/26/11 | 16 |
| 18 | 2.3 Revise Plan | 2 days | Thu 10/27/11 | Fri 10/28/11 | 17 |
| 19 | 2.4 Approve Final Estimate Plan | 0 days | Fri 10/28/11 | Fri 10/28/11 | 18 |
| 20 | **3 Document Review** | **25 days** | **Tue 11/8/11** | **Mon 12/12/11** | |
| 21 | 3.1 Perform Detailed Document Review | 15 days | Tue 11/8/11 | Mon 11/28/11 | 13,14 |
| 22 | 3.2 Site Visit | 4 days | Tue 11/29/11 | Fri 12/2/11 | 21,19 |
| 23 | 3.3 Outbrief | 1 day | Mon 12/5/11 | Mon 12/5/11 | 22 |
| 24 | 3.4 Complete Document Review | 5 days | Tue 12/6/11 | Mon 12/12/11 | 23 |
| 25 | **4 Prepare Estimate** | **35 days** | **Tue 12/13/11** | **Mon 1/30/12** | |
| 26 | 4.1 Prepare ICE | 30 days | Tue 12/13/11 | Mon 1/23/12 | 23,24 |
| 27 | 4.2 Review ICE | 5 days | Tue 1/24/12 | Mon 1/30/12 | 26 |
| 28 | **5 Draft Report** | **15 days** | **Tue 1/31/12** | **Mon 2/20/12** | |
| 29 | 5.1 Prepare Draft Report | 5 days | Tue 1/31/12 | Mon 2/6/12 | 27 |
| 30 | 5.2 OAPM Review | 4 days | Tue 2/7/12 | Fri 2/10/12 | 29 |
| 31 | 5.3 Transmit to Project Team | 1 day | Mon 2/13/12 | Mon 2/13/12 | 30 |
| 32 | 5.4 Project Team Review & Comments | 5 days | Tue 2/14/12 | Mon 2/20/12 | 31 |
| 33 | **6 Reconciliation & Report** | **18 days** | **Tue 2/21/12** | **Thu 3/15/12** | |
| 34 | 6.1 Review Project Team Comments | 5 days | Tue 2/21/12 | Mon 2/27/12 | 32 |
| 35 | 6.2 Reconciliation Meeting | 2 days | Tue 2/28/12 | Wed 2/29/12 | 34 |
| 36 | 6.3 Insert Reconciliation Adjustments | 5 days | Thu 3/1/12 | Wed 3/7/12 | 35 |
| 37 | 6.4 Issue Final Report | 1 day | Thu 3/8/12 | Thu 3/8/12 | 36 |
| 38 | 6.5 OAPM Review | 5 days | Fri 3/9/12 | Thu 3/15/12 | 37 |
| 39 | 6.6 Issue Final Report | 0 days | Thu 3/15/12 | Thu 3/15/12 | 38 |



Note: Completion date will vary based upon project scope, complexity, available documentation, etc.

## APPENDIX F - ICE DOCUMENTATION REQUIREMENTS

The document requirements for a Type II ICE are similar to those required for an ICR. Refer to Appendix M for a complete listing of ICR documents needed at each project stage.

The documents required for an ICE are categorized according to the type of ICE to be performed (Type III, IV, or V). These are tabulated below. Note: If the ICE is being performed at CD-1, some of the documentation listed may not be available; appropriate documentation should be substituted.

| Description | Type III | | Type IV | | Type V | |
|---|---|---|---|---|---|---|
| | Required | Received | Required | Received | Required | Received |
| All site overhead rates, G&A, and other markups | • | | • | | • | |
| Acquisition Strategy | • | | • | | • | |
| Basis of Estimate/Assumptions | • | | • | | • | |
| Complete set of construction and equipment specifications | | | | | • | |
| Conceptual Design Report | • | | • | | • | |
| Construction contract | • | | • | | • | |
| Construction Management Plan | | | | | • | |
| Construction schedule | | | | | • | |
| Contingency and management reserve analysis | • | | • | | • | |
| Costs to date by WBS | • | | • | | • | |
| Critical path schedule | • | | • | | • | |
| Design review comments | • | | • | | • | |
| Detailed project schedule | • | | • | | • | |
| Engineering studies | • | | • | | • | |
| Equipment list and specs | • | | • | | • | |
| Escalation rates and associated rationale and analysis | • | | • | | • | |
| Facility design descriptions | • | | • | | • | |
| Funding Profile | • | | • | | • | |
| Hazard Analysis | • | | • | | • | |

| Description | Type III | | Type IV | | Type V | |
|---|---|---|---|---|---|---|
| | Required | Received | Required | Received | Required | Received |
| Historical information – security issues, local construction climate | | | | | • | |
| Interface Analysis | • | | • | | • | |
| Life Cycle Cost Estimate | • | | • | | • | |
| Material Takeoffs (unless to be developed as part of ICE) | | | • | | • | |
| Mission Need Statement | • | | • | | • | |
| Most recent detailed capital cost estimate and associated basis | • | | • | | • | |
| Piping schedules and specifications | | | | | • | |
| Piping and instrumentation drawings (P & IDs) | • | | • | | • | |
| Preliminary design information | • | | • | | • | |
| Process flow diagrams | • | | • | | • | |
| Procurement lists | • | | • | | • | |
| Project Data Sheets | • | | • | | • | |
| Project Execution Plan | • | | • | | • | |
| Regulatory requirements | • | | • | | • | |
| Resource loaded schedule | • | | • | | • | |
| Risk Management Plan including risk analysis results | • | | • | | • | |
| Risk register | • | | • | | • | |
| Sales tax rate | • | | • | | • | |
| Site labor rates | • | | • | | • | |
| Site productivity factors | • | | • | | • | |
| Staffing plans for project management and administration | • | | • | | • | |
| Start-up Testing and Turnover Planning documents and other operations readiness plans (as appropriate) | • | | • | | • | |
| System design descriptions | • | | • | | • | |
| Title I drawing package (half-size drawings) | • | | • | | • | |

| Description | Type III | | Type IV | | Type V | |
|---|---|---|---|---|---|---|
| | Required | Received | Required | Received | Required | Received |
| Title II drawing package (half-size drawings) | | | • | | • | |
| Unique models/tools used to prepare most recent cost estimate | • | | • | | • | |
| Value Management/Engineering Report | • | | • | | • | |
| Vendor lists for major equipment | • | | • | | • | |
| Vendor quotes for all major equipment/material procurements | • | | • | | • | |
| Work Breakdown Structure (WBS) | • | | • | | • | |
| WBS dictionary | • | | • | | • | |

## Estimate to Complete

ICEs may be required from time to time in order to validate a project's estimate-to-complete (ETC). In this case, the document requirements are somewhat different from a conventional ICE used to establish a project's TPC, since more emphasis is put on actual costs and experience to date. Typical documents required for an ETC are:

| Description | Received |
|---|---|
| Project Execution Plan (PEP) | |
| Performance-based incentive (PBI) award fee information/criteria | |
| Actual costs incurred to date | |
| Actual work completed to date | |
| Contingency remaining | |
| Risk management plan/risk analysis/contingency analysis | |
| Recent contractor monthly progress reports | |
| Pending costs (purchase orders and order requisitions not included in actual costs to date) | |
| Construction/Design drawings and specifications (e.g., civil, structural, mechanical, electrical, instrument, piping) annotated/red-lined to reflect work completed vs. work remaining. | |
| Master Equipment List and associated specifications | |
| Vendor quotations and bids on existing and outstanding procurements | |
| Resource loaded schedule | |
| Construction schedule including critical path schedule | |
| Current detailed cost to complete estimate prepared by contractor and funding profile | |
| Basis of estimate and assumptions | |
| Sales tax rate | |
| Current and projected staffing for project and construction management | |

| Description | Received |
|---|---|
| All labor rates | |
| Site general and administrative rates and overhead markups | |
| Productivity factors used in contractor cost estimate and rationale | |
| Unique security requirements that affect construction performance | |
| Escalation rates used | |
| Escalation analyses of local economy | |
| Work breakdown structure and dictionary | |
| Startup plan | |
| Testing plan, procedures, and status | |
| Operational Readiness Plan | |
| Worker training plans | |
| Other project cost (OPC) information (e.g., readiness reviews) | |
| Lessons learned reports | |
| Project Change Orders/baseline change proposal (BCP) documents | |
| Contractor Change Orders - Processed, Pending, In-Process and Planned | |
| Design Change Notices - Processed, Pending, In-Process and Planned | |
| Subcontract Technical Representatives (STR) commodities tracking/status reports/logs. | |
| Trend analyses for items that may need a BCP but have not impacted the project to date | |
| Contracts for all major work activities | |
| Previous project reviews/analysis | |
| Funding projections/commitments | |
| Request for Equitable Adjustment (REA) analysis (i.e., claims by contractors against the customer for delays impacting cost) | |
| Quality control requirements | |
| Departmental price commitments (e.g., DOE taking on the responsibility for steel and concrete price increases during a construction project) | |