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DOE G 413.3-12
Approved 7-22-2010
Chg 1 (Admin Chg) 10-22-2015

U.S. DEPARTMENT OF ENERGY
Project Definition Rating Index Guide for Traditional Nuclear and Non-Nuclear Construction Projects

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

U.S. Department of Energy
Washington, D.C. 20585

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INITIATED BY:
Office of Project Management Oversight & Assessments

FOREWORD

This Department of Energy (DOE) Guide may be used by all DOE elements. This Guide assists individuals and teams involved in conducting assessments of project definition (i.e. how well has front end planning been conducted to define the project scope) using a numerical project management tool developed by the Construction Industry Institute (CII) that has been tailored for DOE use. The tool is called the Project Definition Rating Index (PDRI). The PDRI is a simple but powerful tool that facilitates the measurement of the degree of scope definition for completeness for traditional construction projects (nuclear and non-nuclear). DOE programs may use alternate methodologies or tailored PDRIs more suitable to their types of projects for conducting their assessments/measurements of completeness of project definition.

DOE Guides are part of the DOE Directives Program and are issued to provide supplemental information and additional guidance regarding the Department's expectations of its requirements as contained in rules, Orders, Notices, and regulatory standards. Guides may also provide acceptable methods for implementing these requirements but are not prescriptive by nature. Guides are not substitutes for requirements, nor do they replace technical standards that are used to describe established practices and procedures for implementing requirements.

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1.0 Introduction

1.1 Purpose

The Project Definition Rating Index (PDRI) for traditional construction projects (nuclear and non-nuclear) is a project management tool designed to increase the likelihood of project success by improving project scope definition, specifically by identifying deficiencies in scope definition early during the front-end planning process. As one of the corrective measures to improve front-end planning within the DOE Project Management Process, DOE proposed the development and implementation of tailored PDRI models by their programs similar to the Construction Industry Institute (CII) PDRI. (References: *DOE, Root Cause Analysis, Contract and Project Management, Corrective Action Plan*, July 2008; and CII, *PDRI for Buildings Projects*, Implementation Resource 155-2, Second Edition, 2006). This DOE Guide provides a tailored model of the CII PDRI for traditional construction projects for use by the DOE programs, as it may apply and is appropriate, when reviewing the levels of adequacy of project scope definition during the project development stages. This document is intended to be a "living document" and will be modified periodically as the understanding of PDRI models and tools evolves within the DOE programs. **DOE programs may use this Guide to develop their own PDRI Manuals/Procedures tailored to their own peculiar capital construction projects and technologies/processes.**

The PDRI should be used during front-end planning that encompasses the project activities from pre-conceptual design through final design. Research has shown the importance of front-end planning on capital projects and its influence on project success. Findings in a CII study have proven that higher levels of front-end planning effort can result in significant cost and schedule savings. Specifically, the research study categorized 53 capital facility projects into three different intensities of front-end planning effort and compared total potential cost and schedule performance differences as follows: [Reference: Gibson, G.E. and Hamilton, M. R. (1994), "*Analysis of pre-project planning effort and success variables for capital projects.*" Report prepared for the CII, University of Texas at Austin, Texas]

- A 20% cost savings with a high level of front end planning effort.
- A 39% schedule savings with a high level of front end planning effort.

Because of the significant savings associated with improved project predictability, the study concluded that a complete scope definition prior to project execution is imperative to project success. The PDRI tool in this Guide based on a score of 1-1000 assists project reviewers in measuring the level of project definition at a given project phase. The higher the score in this scale, the higher the level of project definition is. Other CII studies for industrial projects have shown that scores above 800 (equivalent scale) versus those scoring below 800 at the time of project baselining had:

- Average cost savings for design and construction of 19% versus estimated cost.
- Schedule reduction for design and construction of 13% versus estimated schedule.

- Fewer project changes.

- Increased predictability of operational performance.

[Reference: Gibson, G.E. and Dumont, P.R. (1996), *"Project Definition Rating Index,"* Res. Rep. 113-11 prepared for the CII, University of Texas at Austin, Texas]

This Guide will introduce the PDRI concept for DOE traditional construction projects (nuclear and non-nuclear) as it can be used to measure the degree of scope definition through the different progressive phases in the front-end planning process and to assist in identifying areas of risk consideration where the scoring is low.

1.2 Background

In fiscal year (FY) 1999, the Congressional Committee of Conference on Energy and Water Resources directed DOE to have an independent expert review of DOE's structure and process for managing its projects. In response to this request, DOE asked the National Research Council (NRC) to review and assess the procurement and management of DOE's major construction projects - as well as its environmental restoration and waste management projects. In July 1999, NRC published a report entitled *Improving Project Management in the Department of Energy*. In general, NRC report was very critical of DOE's project management efforts with one of the principal concerns being the lack of up-front planning.

Based on direction from the Office of Environmental Management's (EM's) leadership, a working group was formed of experienced project management professionals representing a cross-section of federal and contractor project management expertise from around the DOE complex. The group developed an EM Project Definition Rating Index (EM PDRI) similar to the CII PDRI for the specific purpose of improving project planning in EM. The initial EM PDRI Manual was released in March-2000, with tailored versions for traditional conventional construction projects, environmental restoration projects, and facility disposition projects. This initial manual was revised subsequently to accommodate the changes from DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and other improvements in the definitions of the rating sub-elements. Similar to the CII, EM has found this up-front planning tool to be very effective in assessing "readiness to proceed" to the next project phase. EM also is finding that the project sub-elements in the PDRI model provide a good road map for planning future activities.

Subsequently, the National Nuclear Security Administration (NNSA) developed its own tailored version of the CII PDRI very similar to the EM PDRI for traditional construction projects (January 2009). The principal purpose of the NNSA PDRI is to assist Integrated Project Teams (IPTs) by identifying key engineering and design elements that are critical to a well defined scope at various phases of the project. In addition, the NNSA PDRI is expected to assist the IPTs in identifying staffing requirements at each project phase; reporting progress on project definition at Quarterly Progress Reviews (QPRs); assessing readiness for Internal and External Project Reviews; and supporting the Acquisition Executive in approving Critical Decisions.

In an April 2008 report on the root cause analysis of contract and project management deficiencies within DOE it was concluded that DOE often does not complete front end planning to an appropriate level before establishing project performance baselines. This had led to scope, cost and schedule increases from the originally approved project baselines (Reference: *DOE, Root Cause Analysis, Contract and Project Management*, April 2008). A Corrective Action Plan to this report was approved in July 2008 which addressed this shortcoming by planning for the development and implementation of tailored PDRI models for the DOE programs similar to the CII PDRI model. The Corrective Action Plan proposes a metric that by the end of FY 2011, 80% of projects (Total Project Cost greater than $100M) will use PDRI methodologies no later than Critical Decision-2 (CD-2). (Reference: *DOE, Root Cause Analysis, Contract and Project Management, Corrective Action Plan*, July 2008)

2.0 What is the PDRI?

The PDRI model used in this Guide is a simple and easy-to-use tool for measuring the degree of scope development for traditional construction projects (nuclear and non-nuclear) within DOE. Tailored versions can be developed by the DOE programs using the basic CII PDRI model for other more specialized projects such as nuclear reactor facilities, decontamination and decommissioning (D&D) projects, environmental restoration projects, facility disposition projects, and other types of projects using other technologies/processes, as it can be applied and found appropriate. It is recognized that Science Programs already have a methodology and processes to assess adequacy of project front end planning. In place of PDRI, the Office of Science may use its own specific methodology to assess the maturity of projects.

The PDRI used in this Guide offers a comprehensive list of 73 scope definition sub-elements within five key major elements for project planning. These major key elements are (1) Cost, (2) Schedule, (3) Scope/Technical, (4) Management Planning and Control, and (5) Safety. Each sub-element within the major key element it belongs to is weighted on its relative importance to the other sub-elements. A scoring scheme through the project stages of development allows the users to evaluate the state of completeness of scope definition at any point prior to detailed design and construction; and where the scoring is low, to quickly predict factors impacting project risk. Since the PDRI score relates to risk, those areas (sub-elements within the major elements, such as safety) that need further work can easily be identified. CII empirical studies have shown that an overall score of 800 (80% based on a scoring scale of 1-1000), or more, prior to determining the project baseline can greatly increase the probability of a successful project. It is recommended in this Guide that a scoring of 900 or better be used for the suitability of a project proceeding to Critical Decision-2, approval of project baseline.

2.1 When to Use the PDRI

This PDRI Guide is intended to be used during front-end planning, which encompasses all activities from pre-conceptual, conceptual, preliminary leading to final design in a project. With goals of significantly improving up-front planning, including integration of safety early into the design process, there is a major emphasis on the extent of project definition in the conceptual design phase of the project that includes Critical Decision-1 (CD-1), approval of alternative selection and cost range. By CD-2, approval of project baseline, the project scope definition should be essentially complete. Also at CD-2, the cost and schedule are established in the performance baseline which requires independent validation per DOE O 413.3A. **The importance of a well defined project scope at CD-2 is highlighted by the DOE O 413.3A expectation that the approved performance baseline for technical scope, cost and schedule will not be exceeded.**

There is much project work (with significant associated costs) to be done following CD-2 and before completion of final design drawings, technical specifications, and construction bid packages. For major projects, there can be several hundred drawings needed before design is complete and the project is ready for the start of construction following approval of CD-3. However, a well developed performance baseline, which includes adequate cost and schedule contingency allowances based on risk, should remain the bounding limit for the project and not be affected by the final design activities. Just as important, the final design activities should not cause the technical scope, safety or security design envelopes for the project established at CD-1 and finalized at CD-2 to be exceeded.

2.2 Benefits of Using the PDRI

Effective front-end planning improves project performance in terms of both cost and schedule, reinforcing the importance of early scope definition and its impact on project success. A significant feature of the PDRI is that it can be utilized to fit the needs of almost of any individual project, small, or large. Sub-elements that are not applicable to a specific project should be marked N/A and have their weighting factor reduced to zero. The weighting of the remaining sub-elements within that major key element (e.g. Cost, Schedule, Scope/Technical, etc.) should be readjusted by spreading the weighting factor of the deleted sub-element proportionally over the remaining weighting factors of the remaining sub-elements so as to maintain the same potential maximum score of 1000. The PDRI is simple to use and can serve as a best-practices tool that can provide numerous benefits to the evaluators, including:

- A checklist that can be used for determining the steps to follow in defining the project scope.
- A standardized terminology of sub-elements that comprise the scope definition for the project under evaluation, as it may apply and considerate appropriate (programs may expand or tailor their version of the sub-elements for scope definition).
- An industry standard for rating the completeness of the project scope definition to facilitate risk assessment and prediction of escalation, and evaluation of the potential for disputes.
- A means to monitor progress at various stages during the front-end project planning effort and to focus efforts in high-risks areas that need definition.
- A tool that aids in communication and promotes alignment between the owners and design contractors by highlighting poorly defined areas in a scope definition package.
- A means for project team participants to reconcile their differences using a common basis for project evaluation.

- A benchmarking tool for interested parties to use in evaluating the completion of scope definition versus the probability of success on future projects.

The PDRI can benefit facility owners such as DOE, as well as designers and constructors. DOE programs and planners can use it as an assessment tool for establishing a comfort level at which they are willing to move forward with projects. Designers and constructors working with DOE can use it as a method of identifying poorly defined project scope definition elements/sub-elements. The PDRI provides a means for all project participants to communicate and reconcile differences using an objective tool as a common basis for project scope evaluation.

3.0 PDRI Description of Scoring System

Individuals involved in the evaluation of the development status for front-end planning for a traditional construction project using the PDRI method in this Guide should use the Project Score Sheets shown in Appendix D, Project Score Sheet (Weighted); and Appendix E, Project Target Scores by Project Phase (Critical Decision Stage). The first weighted score sheet in Appendix D allows the front-end planning/evaluating team to quantify the level of scope definition at any stage of the project (in the sheet it shows the Critical Decision Stages 0-3) on a scale of 1-1000 points. In the second score sheet in Appendix E it provides the suggested target scores for each element and sub-elements of the scope definition criteria that are expected at a given phase of the project (Critical Decision Stage). A complete list of the PDRI's five elements and 73 sub-elements of the scope definition rating criteria is shown in Table 3-1. Appendix F, PDRI – Construction Project Definitions and Target Score Criteria, provides the definitions for each sub-element of the scope criteria to obtain the maximum rating or maturity value.

The summary descriptions and instructions for using the PDRI method in this Guide are given in the subsections as described below.

3.1 PDRI Key Elements (rating elements and sub-elements)

3.2 Sub-Element Definitions

3.3 PDRI Maturity Values

3.4 Scoring the Project

3.5 Inapplicable Sub-Elements

Note: It is recognized that Science Programs already have a methodology and processes to assess adequacy of project front end planning. In place of PDRI, Science Programs may use its own specific methodology to assess the maturity of projects.

TABLE 3.1 PDRI ELEMENTS AND SUB-ELEMENTS

RATING ELEMENTS AND SUB-ELEMENTS			
A. COST	C5. Design Criteria/ Design Margins (How to)	C26. Operating, Maintenance & Reliability (OMR) Concepts	D12. Project Risk Management Plan/Assessment
A1. Cost Estimate	C6. Technology Needs Identified	C27. Safeguards and Security	D13. Quality Assurance Program
A2. Cost Risk/Contingency Analysis	C7. Technology Needs Demonstrated	C28. Heat and Material Balances	D14. Value Engineering
A3. Funding Requirements Profile	C8. Trade-Off Optimization Studies	C29. Reliability, Availability, Maintainability & Inspectability (RAMI) Analysis	D15. Procurement Packages
A4. Independent Cost/Schedule Review	C9. Site Location	C30. Materials Loading/Unloading/Stagin g	D16. Project Acquisition Process
A5. Life Cycle Cost	C10. Plot Plan	C31. Constructability and Construction Planning	D17. Integrated Regulatory Oversight Program
A6. Forecast Cost at Completion	C11. Process Flow Diagrams	C32. Sustainable Design	D18. Inter-Site and On-Site Coordination
A7. Cost Estimate for Next Phase of Work	C12. Natural Phenomena	C33. Transition and Startup Planning	D19. Stakeholder Program
B. SCHEDULE	C13. Layout Drawings and Equipment List	C34. Operations Plans and Procedures	D20. Funds Management
B1. Project Schedule	C14. Piping & Instrumentation Diagrams (P&ID)	**D. MANAGEMENT PLANNING AND CONTROL**	D21. Reviews and Assessments
B2. Major Milestones	C15. Mechanical (Piping)	D1. Mission Need Statement	**E. SAFETY**
B3. Resource Loading	C16. Instrument & Electrical	D2. Acquisition Strategy Plan	E1. Hazard Analysis/Safety Documentation
B4. Critical Path Management	C17. Site Characterization (Including Surveys & Soil Tests)	D3. Key Project Assumptions	E2. Integrated Safeguards and Security Planning
B5. Schedule Risk/Contingency Analysis	C18. Waste Characterization and Disposition	D4. Project Execution Plan (PEP)	E3. ES&H Management Planning (Including ISM)
B6. Forecast of Schedule Completion	C19. Pollution Prevention & Waste Minimization	D5. Integrated Project Team/Project Organization	E4. Emergency Preparedness
B7. Schedule for Next Phase Work Scope	C20. Waste Storage, Packaging and Transportation	D6. Conceptual Design Report (CDR)	
C. SCOPE/TECHNICAL	C21. NEPA Documentation	D7. Baseline Change Control	
C1. Systems Engineering/System Design Descriptions	C22. Long Lead/Critical Equipment and Material List	D8. Project Control	
C2. Alternative Analysis	C23. Design Completion	D9. Project Work Breakdown Structure (WBS)	
C3. Functional and Operational Requirements	C24. Design Reviews	D10. Resources Required (People/Material) for Next Phase	
C4. Design Basis (How)	C25. Interface Planning & Control	D11. Configuration Management	

3.1 PDRI Key Elements

The tailored PDRI used in this Guide for DOE traditional construction has five Key Elements for defining completeness of front-end planning (scope definition). These are: (1) Cost, (2) Schedule, (3) Scope/Technical, (4) Management Planning and Controls, and (5) Safety.

For each of the project planning Key Elements, there are various Sub-Elements that, in total, provide a good indication of project planning maturity at each stage of the project as empirically proven by the CII model it emulates. Some of the Sub-Elements may not be applicable to some projects which may require re-adjustments to the weighting of the Sub-Elements under the Key Element they belong to maintain the maximum targeted score for that Key Element (see Section 3.4.1 for an explanation of the scoring mechanics). A summary of the number of Sub-Elements is given in Table 3-2. The specific Sub-Elements, and their definitions, for DOE traditional construction projects (nuclear and non-nuclear) are given in Table 3-1 and Appendices D and F.

TABLE 3-2 NUMBER OF SUB-ELEMENTS FOR DOE TRADITIONAL CONSTRUCTION PROJECTS

Rating Area Elements	Sub-Elements for Construction Projects
A. Cost	7
B. Schedule	7
C. Scope/Technical	34
D. Management Planning and Control	21
E. Safety	4
Totals	**73**

3.2 Sub-Elements Definitions

Key Elements group together all Sub-Elements that apply to an aspect of a project in a logical sequence. Associated with each Sub-Element is a definition that provides the criterion for achieving the maximum score or maturity rating of "5" for the Sub-Element (see Appendix F for the definitions). The definitions are generally qualitative and are expected to improve as more experience is gained in the use of the PDRI by the DOE programs for use in their tailored PDRI manuals, as applicable and appropriate.

As with many rating systems, it is difficult to provide comprehensive and detailed definitions that are fully meaningful to a wide range of activities, as is the case with DOE projects. In general, the definitions provided in the PDRI Guide establish a basis for determining that a Key Element/Sub-Element is fully matured and, and just as importantly, demonstrates a high degree of quality planning. It is important to note that maturity values discussed in the next section are meant only to measure the degree of completeness and/or the extent that an Element or Sub-element meets the DOE O 413.3A requirements and/or other more specific criteria for that Element/Sub-element (such as meeting the safety expectations in DOE STD 1189, *Integration of*

Safety into the Design Process). Maturity values are not to be construed as a subjective measure of merit or perceived technical quality that is not directly related to the definition criteria for that Element/Sub-element.

3.3 PDRI Maturity Values

The PDRI Maturity Value provides a numerical rating system (from 0 to 5) based upon the maturity of each particular Sub-Element, as provided by the Sub-Element definition. A “0” value effectively means that the criteria embodied in the Sub-Element definition is not met at all; a value of “5” means <u>full compliance</u> with the Sub-Element <u>definition criteria</u>, which describes the ideal end state. In general, Maturity Values should be developed by applying the qualitative and quantitative criteria in Table 3-3 to the Sub-Element definitions. (Note: Ultimately, as explained in Section 3.4, the Maturity Value rating is multiplied by a specified weighting factor to obtain a PDRI score). For some DOE projects, a Sub-Element criterion may not be applicable. In that case, an “N/A” should be entered as the maturity value on the PDRI score sheet. The other Sub-Elements criteria weights should be adjusted proportionally to preserve the maximum score for the Key Element to which they belong (this assures the same weight balances among the five main Key Elements and the 1000 maximum score level).

The Maturity Value rating should be recorded on the PDRI score sheet. The expected or “targeted” Maturity Value rating shown on the Appendix E should not be changed by the assessor, but will vary depending on the phase of the project and can be used as a guide for what to expect at each project phase. For example, a Maturity Value rating of “1” for the Sub-Element “Cost Estimate” during the Pre-Conceptual Design phase (CD-0) is the expected rating (i.e., the element matches expectations for that stage of the project). On the other hand, a Maturity Value rating of “1” at the end of the Preliminary Design phase (CD-2) indicates a potentially serious project deficiency since the expected maturity rating for that Sub-Element at that project stage is “5”. Similarly, a Maturity Value rating of “5” is expected to be applied at CD-0 (and for all subsequent CDs) for all Sub-Elements that should be fully defined during the pre-conceptual phase of the project, such as the Sub-Element “Mission Need Statement” in the “Management Planning and Control” Key Element.

For those projects where the subcontractor is responsible for providing critical project documents (e.g., Health and Safety Plan, Quality Assurance Plan, etc.) after the bid award, (such as with Design-Build (D-B) projects), a maturity Value rating of “5" is acceptable, provided that the requirements are <u>fully and completely</u> communicated in the contracting documents (e.g., special conditions, drawings, specifications, etc.).

While Table 3-3 criteria are used in assessing the Maturity Value of various Sub-Elements, the Project Manager/staff or the independent Review Team scoring a particular Sub-Element are free to use some discretion based upon supporting documentation. For example, where the preparation of a project-specific Quality Assurance Plan may not have been started, but a documented and approved site-wide Quality Assurance Program is in place and fully implemented, the reviewer may assign a Maturity Value of “1” or “2” to the Quality Assurance Project Plan Sub-Element even though that document doesn’t yet exist due to the overall maturity of the site quality management system.

The Maturity Values ratings for each of the Sub-Elements are used to determine the PDRI score for each Sub-Element, and the overall score of the project as described in Section 3.4.

TABLE 3-3 MATURITY VALUE RATING CRITERIA

Maturity Value Rating	Qualitative Criteria	Quantitative Criteria (% Complete)
N/A	Not Applicable	-
0	Work Not Started	0
1	Work Initiated	1-20
2	Concept Defined	21-50
3	Substantive Working Detail	51-80
4	Final Draft	81-95
5	Complete/Fully Meets Definition Criteria	96-100

3.4 Scoring the Project

Each Maturity Value rating ("0" to "5") for each Sub-Element is multiplied by its respective weighting factor and shows in the scoring spreadsheet the importance of that Sub-Element relative to the others within the grouping and to the project overall. There are two levels of priority: "H" designates a high priority Sub-Element and a "P" designates a pro-rated Sub-Element (lower weight). The weight of these priority factors may vary by project type; such as, traditional construction vs. clean up projects, or other specialized non-traditional construction type of project, and should be codified in that specific DOE program published PDRI Manual/Procedures, as it may apply and appropriate. However, for traditional construction projects the weighting factors shown in this Guide may be used for consistency sake. Otherwise, the shifting of weighing schemes would hinder comparable measurement of progress within projects, between projects, or between self assessments and independent review team PDRI results. For example, the sub-element "Pollution Prevention/Waste Minimization" is given an "H" weighting factor for clean-up projects in the EM PDRI Manual, as it is a significant part of that work. However, it is given a "P" weighting factor for a construction project in this Guide in the "Scope/Technical" Element, because it is only an incidental aspect of that work for traditional construction. When multiplied by the rating, the weighting factors produce a score for each Sub-Element.

3.4.1 Scoring System Bases

The underlying bases of the PDRI Guide weighted scoring system are:

1. The overall maximum score is 1000 points at the completion of the final project phase (CD-3). This score reflects an <u>ideal</u>, fully matured project planning at a stage just prior to project implementation with a maximum Maturity Value rating (i.e., "5") assigned to each Sub-Element.

2. The maximum score for each Key Element (e.g., Cost, Schedule, etc.) was established principally by considering both the number of Sub-Elements in each Key Element group and the relative importance of the Key Elements for defining a successful project. For example, for a project at the final phase (CD-3), the distribution of the 1000 points among each of the Key Elements, and the number of Sub-Elements is as shown in Figure 3-1 (this data was correlated from CII empirical data and DOE-EM/NNSA experience with traditional construction).

3. The overall approximate "targeted" score depends on the project phase as indicated below for traditional construction projects (Figure 3.1). The basis for each of the approximate "targeted" scores shown below can be found in Appendix E. Targeted scores should only be used as a subjective indicator of the quality of front-end planning and not as a "pass" or "no pass" indicator. Low scores should mandate an explanation for further evaluation.

4. Some Sub-Elements are more important than others, and such Sub-Elements are designated as high priority ("H"). The combination of all "H" Sub-Elements for a given Key Element receives approximately 50 percent of the points for that Key Element maximum scoring. For example, Sub-Elements designated "H" for the "Cost" Key Element for Final Design (CD-3) would have a total value of 75 of the total 150 points for that Key Element. All of the "P" Sub-Elements would also total 75 as shown in Appendix E for the "Cost" Key Element. However the "P" Sub-elements will have a lower weight value because they outnumber the number of "H" Sub-elements.

5. To account for the fact that some Sub-elements may not be applicable (i.e., N/A) for various projects, and to maintain consistent "targeted" scores for each Key Element (e.g., 300 points for Pre-Conceptual or 900 points at the end of Preliminary Design), Sub-Elements not designated by an "H" are designated by a "P" (are pro-rated). The use of "H" and "P" weighting allows for keeping the "targeted" score the same for all phases, while accounting for the fact that some Sub-Elements are more important than others, and allows proportional adjustments in the weights when a Sub-Element is identified as N/A. (See Section 3.4.2 for an explanation of "Target Scores.")

   <u>Note</u>: This works well as long as the number of "P" Sub-Elements outnumbers the number of "H" Sub-elements for any given Key Element. If there is an equal number or greater number of "H" Sub-Elements than "P" Sub-Elements (normally when some "P" Sub-Elements were considered N/A or were not rated) for any given Key Element, the scoring sheet should be adjusted to give more weight to the "H" Sub-Elements so as to maintain the maximum target score for the Key Element. A good rule of thumb is to give the "H" Sub Elements 1.5 times the weighted value of the "P" Sub-Elements where the combination of the weighted values times the maximum rating criteria ("5") should equal the Key Element maximum scoring.

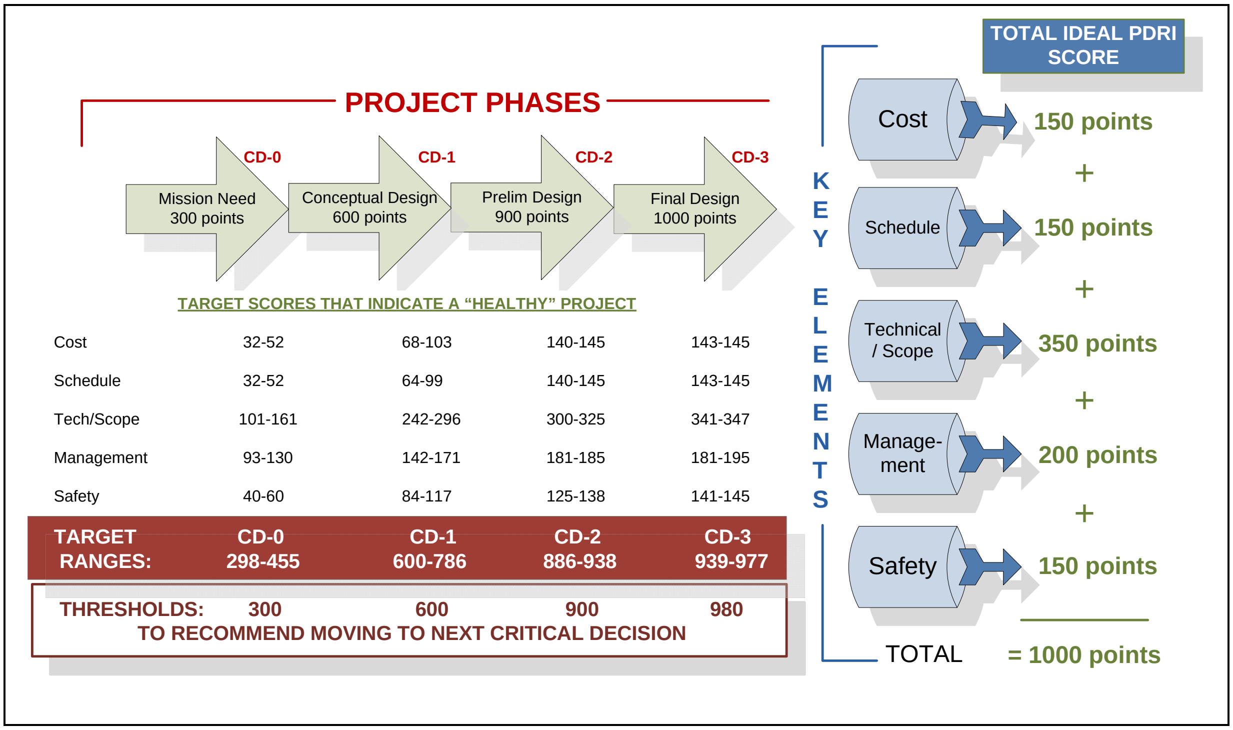

FIGURE 3.1 MAXIMUM AND TARGET SCORES FOR KEY ELEMENTS ON DOE CONSTRUCTION PROJECTS

6. At completion of the Preliminary Design Phase (prior to CD-2 in Figure 3.1), the total target score is set at 900 points out of 1000 (90 percent level). In terms of actual work in a traditional construction project, the completion of the Preliminary Design Phase is approximately 35 percent or more of the total design effort. However, the PDRI target score is set at the 90 percent maturity level to ensure that the planning and preliminary design effort will provide a more accurate performance baseline which will include a rigorous assessment of project risks and associated cost and schedule contingency.

3.4.2 Target Scores

Target scores are those scores for a Sub-Element that is expected at a given phase of each project. Based on the above, projects are scored and then compared to targeted values. Taken in their entirety, target scores provide a good indication of how well a project is actually defined versus how well it should be defined at any given stage. Target scores increase from early to later phases of a project, and should not be changed by the assessor. Sub-Elements that are expected to mature more slowly will have correspondingly lower target scores at the early stages of the project than others with more rapid maturity levels. Target Scores are presented in Appendix E for comparison with actual evaluation scores reported in the score sheet in Appendix D.

3.4.3 Project Score

For each Sub-Element the actual score is determined by multiplying its Weighting Factor by the appropriate Maturity Value rating. After each Sub-Element score is calculated, the score for each Key Element (Cost, Schedule, Scope/Technical, Management Planning and Control, and Safety) and the Total Project Score are totaled.

3.4.4 Design-Build (D-B) Projects

It should be noted that the score sheets and the definitions in Appendices D, E and F do not adequately account for the particular differences that would be encountered in a Design-Build (D-B) acquisition strategy. This is because in D-B acquisitions (as opposed to the more conventional Design/Bid/Build), the subcontractor is responsible for the creation of many of the important project documents after the bid has been awarded. The PDRI definitions in Appendix F assume that most of these documents will be generated before the bidding process and, therefore, scores for D-B projects may be lower than the maturity of the project warrants. These differences should be fully explained in the review report that accompanies the PDRI review. This is also true for components procured through a "performance specification." The actual design will be completed after the procurement is made.

3.5 Inapplicable Sub-Elements

Certain Sub-Elements are not expected to be completed (or even started) at early stages of a project. For these Sub-Elements, the rating showing expected Maturity Values should be given an "N/A." When totaling the scores, N/A should be considered to be zero (0), but does not negatively affect the scores.

Prior to using this PDRI system for a specific project, all Sub-Elements should be reviewed for applicability through all phases of the project. If a particular Sub-Element is not applicable (N/A) for the specific project through all phases, it should be so noted and the weights of the other Sub-Elements should be re-calculated proportionally to keep the total possible score equal to 1000 (see Section 3.4.1, steps 4 and 5, for the readjustments). Ratings cells should not be left blank. A blank cell means the assessor did not feel qualified to rate a particular Sub-Element. The assessor(s) should be able to rate every Sub-Element, or additional assessors should be included in the review.

4.0 Philosophy of Use - Who Should Perform the PDRI?

The PDRI rating should be performed by assessors. Assessors may consist of the Project Management Team for a given project, or independent review groups that are well-versed in project management concepts, and have a good understanding of the particular project. The Project Management Team usually may be asked to self-assess the project. DOE O 413.3A requires an independent assessment at different project phases for different sized projects. (Reference: DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets, Table 2, Critical Decision Requirements*)

Ideally, the project team and/or an independent review team should conduct a PDRI evaluation at various points in the project. Experience has shown that the scoring process works best in a team environment with a neutral facilitator familiar with the project. The facilitator provides objective feedback to the team and controls the pace of team meetings. If this arrangement is not possible, an alternate approach is to have key individuals evaluate the project separately, then evaluate it together, ultimately agreeing on a final evaluation. Even using the PDRI from an individual standpoint provides a method for project evaluation.

Users experience (CII, private entities and other Federal Agencies) has shown that the PDRI is best used as a tool to help project managers (project coordinators, project planners) organize and monitor progress of the front end planning effort. In many cases, a planner may use the PDRI prior to the existence of a team in order to understand major risk areas. Using the PDRI early in the project life cycle will usually lead to high PDRI scores later. This is considered good practice since the early completed score sheets provide a road map of areas that are weak in terms of definition and need more focused attention.

The PDRI provides an excellent tool to use in early team meetings in that it provides a means for the team to align itself on the project and organize its work. Experienced PDRI users feel that the final PDRI score is less important than the process used to arrive at that score. The PDRI also can provide an effective means of handing off the project to other entities or helping maintain continuity as new project participants are added to the project.

If the organization has front-end planning procedures and execution standards and deliverables in place, many PDRI elements may be partially defined when the project begins front end planning. An organization may want to standardize many of the PDRI element/sub-elements to improve cycle time of planning activities.

PDRI scores may change on a day-to-day or week-to-week basis as team members realize that some elements are not as well-defined as initially assumed. It is important to assess the elements/sub-elements both in content and quality in an honest unbiased manner (do not use the score sheet as a simple check-list of documentation in place). The level of maturity of existing relevant project documentation should be assessed as part of the sub-element rating. Any changes that occur in assumptions or planning parameters need to be resolved with earlier planning decisions. The target score may not be important as the team's progress over time in resolving issues that harbor risk.

When using the PDRI on small projects, the assessor/project team may determine a new target score at which it feels comfortable when recommending authorization for a project for detailed design and construction (the maturity levels and weights for some sub-elements may vary by the type/size of the project and acquisition strategy). Each program/organization should develop an appropriate threshold range of scores for the particular phase of front-end planning after some experience using the PDRI. The threshold is dependent upon the size, type, and complexity of the project, to include specific energy efficiency, safety, health and security considerations (For example; a standard cooling tower with chiller units may not need a score of 900 before going to procurement/construction if the functional and performance requirements fall within the commercially available ranges of performance or boiler plate designs).

> **Caution**: Using the PDRI for this purpose should be done carefully or else elements/sub-elements that are more important for small projects may be given less emphasis than needed. The operative phrase for using the PDRI in these situations is common sense. An experienced facilitator can help in this regard.

Another point that needs to be made is that experience (lessons learned) from users has shown that successful implementation of the PDRI process requires training. Several facilitators should be trained, and the number will vary by organization and the projects that will require its use to assist decision making (such as authorization for Critical Decisions). The objective is to insure that every project has access to a trained facilitator in a timely manner, when required and appropriate. The facilitator should not be a member of that project team. In many organizations, project managers are trained as facilitators for their peer's projects.

In addition to a cadre of trained facilitators, all key members participating in a PDRI review process should understand the PDRI model and process. In most cases, this can be accomplished with just-in-time training. The facilitator will brief the participants on the purpose and their role to make the session a success, and then the facilitator will comment on specific behaviors as they progress through the assessment session.

5.0 Analyzing PDRI Scores - What to Look for?

The PDRI is of little value unless the user takes action based on the analysis and uses the score in managing the project. Among the potential uses when analyzing the PDRI score are the following:

- Track the project progress during front-end planning using the PDRI score as a macro-evaluation tool. Individual elements and sub-elements can be tracked as well. It is recommended that the method of scoring the project over time (whether individual or team-based) should be consistent because it is a subjective rating.

- Compare project-to-project scores over time in order to look at trends in developing scope definition within your organization.

- Compare different types of projects (e.g., laboratory vs. manufacturing vs. office; or new vs. renovation, etc.) and determine your acceptable PDRI score for those projects and identify critical success factors from that analysis.

- Determine a comfort level (PDRI score) at which you are willing to recommend authorization for the project for final design.

- Look at weak areas for your project at the element level or sub-element level over time. By adding these sub-elements' PDRI scores, one can see how much risk they bring to the project relative to 1000 points. This provides an effective method of risk analysis since each sub-element and element is weighted relative to each other in terms of potential risk exposure. Use the PDRI score to redirect effort by the project team.

- The individual sub-element scores can be used to highlight the "critical few" sub-elements for team focus – either through segregating by sub-element score or definition level. Remember that the weights given in the score sheet were developed for a generic traditional construction project. *Your project may have unique requirements that should be met, therefore examine the level of definition in some amount of detail because the score may not be reflective of the project's complexity or makeup.*

Program requirements or other pressures to reduce project cycle times may force a team to begin design and construction of projects with underdeveloped definition. In these instances, the amount of time available for defining the scope of the project decreases. Thus, the ability to predict factors that may impact project risk becomes critical. To minimize the possibility of problems during detailed design, construction, and commissioning phases of a project, the front-end planning effort should focus on the critical few sub-elements that, if poorly defined, could have the greatest potential to negatively impact project performance.

5.1 Potential PDRI Score Applications

The Program/Field Office/Project (Center) may want to keep their own database of PDRI scores for various project sizes and types. As more projects are completed and scored using the PDRI, your ability to accurately predict the probability of success for future projects should improve. The PDRI may serve as a gauge for the Center in deciding whether or not to move forward with design and construction of a project. You may also wish to use it as an external benchmark for measurement against the practices of other industry leaders or Centers.

Once a PDRI score is obtained, it is important to correlate the score to a measurement of project success. The measurements of project success used by the *CII PDRI for Building Projects Research Team* (1999) are suggested critical performance factors in the execution and operation of a capital facility. In general, higher PDRI scores represent scope definition packages that are well-defined and correspond to higher project success. Lower PDRI scores, on the other hand, may signify that certain elements in the scope definition package lack adequate definition and, if the project moves forward with development of construction documents, could result in poorer project performance and lower success.

The program element may want to track the project estimates minus contingency when plotting them versus the PDRI scores. The original estimates are then compared to the final outcome of the project to evaluate its success versus these goals. The program may plot these estimates to develop a curve for reviewing the adequacy of the contingency allowance on future similar projects. (Reference on how to develop these curves: *PDRI, Industrial Projects*, Implementation Resource 113-2, CII, Austin, TX, July 1996)

6.0 Lessons Learned Using the PDRI

Specific lessons learned using the PDRI process includes: (Source: *CII PDRI for Building Projects Research Team*)

- The PDRI should be used at a minimum of two times during project planning.
- A facilitator provides a neutral party to help maintain consistency when scoring projects.
- Using the tool is an excellent way to align a project team.
- Because of project pressures, it is often difficult to get the right project participants together to score a project, but the results are worthwhile.
- The tool provides an excellent mechanism to identify specific problems and assign actions.
- The team or individual scoring the project should focus on the scoring process, rather than the final score, in order to honestly identify deficiencies.
- Use the PDRI initially on pre-selected pilot projects in order to gain proficiency with using the tool.

- Train individuals in the use and background of the tool in order to improve consistency.

- The PDRI is effective even when used very early in the planning process. Individual planners can use the tool at this point to identify potential problems and to organize their work effort.

- Care should be taken when determining level of definition of the sub-elements such as maintenance philosophy or operating philosophy to maintain (within field element/site) consistency of scoring due to existence of internal standards in many organizations. It is hard to compare the level of definition of one project to another if there is no consistency.

Note: It is recognized that Science Programs already have a methodology and processes to assess adequacy of front end planning. In place of PDRI, Science Programs may use its own specific methodology to assess maturity of projects.

APPENDIX A: GLOSSARY

1. Accident Basis. Historically consisting of formal documentation of numerical estimates of the expected consequence of potential accidents associated with a facility. Accident analysis focuses on the identification of safety controls while defining environmental conditions, which are used to drive design requirements for such controls.

2. Acquisition Executive. The individual designated by the Secretary of Energy to integrate and unify the management system for a program portfolio of projects and implement prescribed policies and practices. He/she is the approving authority for a project's Critical Decisions, per DOE O 413.3A.

3. Authorization Basis. Those aspects of the facility design basis and operational requirements relied upon by DOE to authorize operation.

4. Conceptual Safety Design Report (CSDR). A Conceptual Safety Design Report is developed to:

   - document and establish a preliminary inventory of hazardous materials, including radioactive materials and chemicals;
   - document and establish the preliminary hazard categorization of the facility;
   - identify and analyze primary facility hazards and facility Design Basis Accidents;
   - provide an initial determination, based on preliminary hazard analysis, of Safety Class and safety significant structures, systems, and components (SSC);
   - include a preliminary assessment of the appropriate Seismic Design Category for the facility itself, as well as the safety significant structures, systems, and components;
   - evaluate the security hazards that can impact the facility safety basis (if applicable); and;
   - include a commitment to the nuclear safety design criteria of DOE O 420.1B, *Facility Safety*, (or proposed alternative criteria).

5. Conceptual Safety Validation Report (CSVR). The report prepared by DOE that documents the DOE review of the Conceptual Safety Design Report.

6. Critical Technology Element (CTE). A technology element is "critical" if the system being acquired depends on the technology element to meet operational requirements (with acceptable development, cost and schedule; and with acceptable production and operations costs) and if the technology element or its application is either new or novel.

7. Design Basis. The set of requirements that bound the design of systems, structures, and components within the facility. Those design requirements include consideration of safety, plant availability, efficiency, reliability, and maintainability.

8. Documented Safety Analysis (DSA). A documented analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the

environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety.

9. External Independent Review. A project review conducted by individuals outside DOE. The Office of Engineering and Construction Management selects the appropriate contractor to perform these reviews. One of the most common types of External Independent Reviews is the Performance Baseline External Independent Review that is utilized to support validation of the Performance Baseline for Critical Decision-2. A second common type is the Construction/Execution Readiness External Independent Review that supports Critical Decision-3, approve start of construction, for Major System Projects.

10. Fire Hazards Analysis (FHA). A comprehensive assessment of the potential for a fire at any location to ensure that the possibility of injury to people or damage to buildings, equipment, or the environment is within acceptable limits (NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*).

11. Functional and Operational Requirements (F&ORs). Within Project Management, F&ORs translate program requirements into design products at the early stages of project development. Project technical requirements are translated from the mission need statement, to program requirements, to F&ORs, to design criteria, and finally documented in Facility/System Design Descriptions. In general terms, the F&ORs will describe the processes and systems that must be included in a project to meet program requirements and fulfill program capabilities articulated in the project mission need statement.

12. Hazards Analysis (HA). This analysis supports PDSA development during Preliminary and Final Design and identifies the types and magnitudes of hazards that are anticipated in the facility. This level of hazard analysis expands the PHA to include evaluation of the process hazards.

13. Independent Cost Estimate. A documented independent cost estimate prepared by an entity outside the proponent program and project being reviewed that has the express purpose of serving as an analytical tool to validate, crosscheck, or analyze cost estimates developed by the project proponents. The key attribute of independent cost estimates is that they are prepared independently of the project proponent estimate.

14. Independent Cost Review. A project management tool used to analyze and validate an estimate of project costs by individuals having no direct responsibility for project performance.

15. Independent Project Review. A project management tool that serves to verify the project's mission, organization, development, processes, technical requirements, baselines, progress, and/or readiness to proceed to the next successive phase in the DOE's Acquisition Management System.

16. Integrated Project Team (IPT). An Integrated Project Team is a cross-functional group of individuals organized for the specific purpose of delivering a project to an external or internal customer. For the purposes of this Standard, this team may be composed of both Federal and contractor (or subcontractor) personnel, and it will support and report to the Federal Project Director. For complex or hazardous projects, a subordinate contractor IPT (CIPT) may be formed to support the Federal IPT and Project Director.

17. Major Modification. Modification to a DOE nuclear facility that is completed on or after April 9, 2001, that substantially changes the existing safety basis for the facility.

18. Operational Environment. Environment that addresses all the operational requirements and specifications required of the final system to include platform/packaging.

19. Preliminary Documented Safety Analysis Report (PDSA). Documentation prepared in connection with the design and construction of a new DOE nuclear facility or a major modification to a DOE nuclear facility that provides a reasonable basis for the preliminary conclusion that the nuclear facility can be operated safely through the consideration of factors such as:

- the nuclear safety design criteria to be satisfied.
- a safety analysis that derives aspects of design that are necessary to satisfy the nuclear safety design criteria.
- an initial listing of the safety management programs that must be developed to address operational safety considerations.

20. Preliminary Hazards Analysis (PHA). This document provides a broad hazard-screening tool that includes a review of the types of operations that will be performed in the proposed facility and identifies the hazards associated with these types of operations and facilities. The results of the PHA are used to determine the need for additional, more detailed analysis; serve as a precursor where further analysis is deemed necessary; and serve as a baseline hazard analysis when further analysis is not indicated. The PHA is most applicable in the conceptual design stage, but it is also useful for existing facilities and equipment that have not had an adequate baseline hazard analysis.

21. Preliminary Safety Design Report (PSDR). The report developed during Preliminary Design that updates and provides additional site and design details to those provided in the CSDR. The PSDR follows the format and content of the PDSA produced during final design.

22. Preliminary Safety Validation Report (PSVR). The report prepared by DOE that documents the DOE review of the Preliminary Safety Design Report.

23. Project Definition Rating Index (PDRI). This is a project management tool used for assessing how well the project scope is defined. The tool uses a numeric assessment which rates a wide range of project elements and sub-elements to determine how well the project is defined.

24. Safety Analysis. A documented process: (1) to provide systematic identification of hazards within a given DOE operation; (2) to describe and analyze the adequacy of the measures taken to eliminate, control, or mitigate identified hazards; and (3) to analyze and evaluate potential accidents and their associated risks.

25. Safety Basis. Safety basis means the documented safety analysis (DSA) and hazards controls that provide reasonable assurance that a DOE nuclear facility can be operated safely in a manner the adequately protects workers, the public, and the environment.

26. Safety Design Strategy (SDS). The SDS, as part of the Project Execution Plan, provides a strategy for the early safety design basis development starting in the pre-conceptual design phase. The SDS documents all applicable Safety-in-Design expectations for the early project phases.

27. Safety-in-Design. The process of identifying and incorporating appropriate structures, systems, and components (SSC) and their associated safety functions and design criteria into the project design to provide adequate protection for workers and the public.

28. Safety Evaluation Report (SER). The report prepared by DOE to document (1) the sufficiency of the documented safety analysis for a Hazard Category 1, 2, or 3 DOE nuclear facility; (2) the extent to which a contractor has satisfied the requirements of Subpart B of 10 C.F.R. Part 830; and (3) the basis for approval by DOE of the safety basis for the facility, including any conditions for approval.

29. Safety Limits. **T**he limits on process variables associated with those safety-class physical barriers, generally passive, that are necessary for the intended facility function and that are required to guard against the uncontrolled release of radioactive materials.

30. Technical Independent Project Review (TIPR). A form of an independent project review usually conducted prior to obtaining Critical Decision-1, Alternative Selection and Cost Range, for high risk, high hazard, and Hazard Category 1, 2, and 3 nuclear facilities. As a minimum, the focus of this review is to determine that the safety documentation is sufficiently conservative and bounding to be relied upon for the next phase of the project. TIPR's can also be conducted any time during the project life-cycle when there is a need to focus on various project technical issues such as safety, technology maturity, or others. A TIPR could include TRA's for projects which include identified critical technology elements in the project scope.

31. Technology Readiness Assessment (TRA) Review. A TRA is an assessment of how far technology development has proceeded. It provides a snapshot in time of the maturity of technologies and their readiness for insertion into the project design and execution schedule.

APPENDIX B: ACRONYMS

AE	Acquisition Executive
ALARA	As Low as Reasonable Achievable
AS	Acquisition Strategy
BOD	Basis of Design
CD	Critical Decision
CDR	Conceptual Design Report
CFR	Code of Federal Regulations
CII	Construction Industry Institute
CO	Contracting Officer
CSDR	Conceptual Safety Design Report
CTE	Critical Technology Element
CY	Calendar Year
DBA	Design Basis Accident
DBT	Design Basis Threat
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EIR	External Independent Review
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EMP	Emergency Management Program
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety and Health
ESAAB	Energy Systems Acquisition Advisory Board
EVMS	Earned Value Management System
FAR	Federal Acquisition Regulations
FPD	Federal Project Director
FONSI	Finding of No Significant Impact
F&ORs	Functional and Operational Requirements
FMEA	Failure Mode and Effects Analysis
FY	Fiscal Year
GAO	Government Accountability Office
GFE	Government Furnished Equipment

GPRA	Government Performance and Results Act
HA	Hazard Assessment
HAZOPS	Hazards of Operations
HVAC	Heating, Ventilation and Air Conditioning
ICE	Independent Cost Estimate
ICR	Independent Cost Review
IMS	Integrated Master Schedule
IOC	Initial Operating Capability
IPR	Independent Project Review
IPS	Integrated Project Schedule
IPT	Integrated Project Team
ICE	Independent Cost Estimate
IPR	Independent Project Review
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISO	International Standards Organization
IT	Information Technology
KPP	Key Performance Parameter
LEED	Leadership in Energy and Environmental Design
LLC	Life Cycle Cost
MNS	Mission Need Statement
MS	Major System Project
N/A	Not Applicable
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NPH	Natural Phenomena Standard
NQA-1	Nuclear Quality Assurance Standard – 1 (ANSI/ASME standard)
NRC	National Research Council
OBS	Organizational Breakdown Structure
OECM	Office of Engineering and Construction Management
OMB	Office of Management and Budget
OPC	Other Project Costs
ORR	Operational Readiness Review

OSHA	Occupational Safety and Health Administration
PARS	Project Assessment and Reporting System
PB	Performance Baseline
PBC	Performance-Based Contract
PBS	Performance Baseline Summary
PDSA	Preliminary Documented Safety Analysis
PDS	Project Data Sheet
PED	Project Engineering and Design
PEP	Project Execution Plan
PFDs	Process Flow Diagrams
PHA	Preliminary Hazard Analysis
P&IDs	Piping and Instrumentation Diagrams
PC	Performance Category
PM	Program Manager
PMB	Performance Measurement Baseline
PPBES	Planning, Programming, Budgeting and Execution System
PSDR	Preliminary Safety Design Report
PSO	Program Secretarial Office
PMSO	Project Management Support Office
QA	Quality Assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Program Plan
QC	Quality Control
RAMI	Reliability, Accessibility, Maintainability, Inspectability
RCRA	Resource Conservation and Recovery Act
RD	Requirements Document
RFP	Request for Proposal
RLS	Resource Loaded Schedule
SAE	Secretarial Acquisition Executive
SC	Safety Class
SDD	System Design Description
SDS	Safety Design Strategy
SER	Safety Evaluation Report
SME	Subject Matter Expert

SS	Safety Significant
SSC	Structure, System and Component
TEC	Total Estimated Cost (Capital)
TIPR	Technical Independent Project Review
TPC	Total Project Cost
TRA	Technology Readiness Assessment
TSR	Technical Safety Requirements
TRL	Technology Readiness Level
VM	Value Management
WBS	Work Breakdown Structure
WA	Work Authorization

APPENDIX C: REFERENCES

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29 CFR 1910.119, Process Safety Management of Highly Hazardous Substances.

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APPENDIX D
Project Definition Rating Index Traditional Construction Projects(Nuclear, Non-Nuclear), Scoring Sheet

Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
A. COST											
A1	Cost Estimate	H	7.5								
A2	Cost Risk/Contingency Analysis	P	3.0								
A3	Funding Requirements/Profile	H	7.5								
A4	Independent Cost/Schedule Review	P	3.0								
A5	Life Cycle Cost	P	3.0								
A6	Forecast Cost at Completion	P	3.0								
A7	Cost Estimate for Next Phase Work Scope	P	3.0								
Subtotal Cost Element											
B. SCHEDULE											
B1	Project Schedule	H	7.5								

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				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
B2	Major Milestones	P	3.0								
B3	Resource Loading	P	3.0								
B4	Critical Path Management	H	7.5								
B5	Schedule Risk/Contingency Analysis	P	3.0								
B6	Forecast of Schedule at Completion	P	3.0								
B7	Schedule for Next Phase Work Scope	P	3.0								
Subtotal Schedule Element											
C. SCOPE/TECHNICAL											
C1	Systems Engineering/System Design Descriptions	H	3.2								
C2	Alternative Analysis	H	3.2								

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				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
C3	Functional and Operational Requirements	H	3.2								
C4	Design Basis (How)	H	3.2								
C5	Design Criteria/Design Margins (How to)	P	1.51								
C6	Technology Needs Identified	P	1.51								
C7	Technology Needs Demonstrated	H	3.2								
C8	Trade-Off Optimization Studies	P	1.51								
C9	Site Location	P	1.51								
C10	Plot Plan	P	1.51								
C11	Process Flow Diagrams (PFDs)	P	1.51								
C12	Natural Phenomena	P	1.51								
C13	Layout Drawings and	P	1.51								

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Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
	Equipment List										
C14	Piping & Instrumentation Diagrams (P&ID)	H	3.2								
C15	Mechanical (Piping)	P	1.51								
C16	Instrument & Electrical	P	1.51								
C17	Site Characterization (Including Surveys & Soil Tests)	P	1.51								
C18	Waste Characterization and Disposition	H	3.2								
C19	Pollution Prevention & Waste Minimization	P	1.51								
C20	Waste Storage, Packaging and Transportation	H	3.2								
C21	NEPA Documentation	H	3.2								
C22	Long Lead/Critical Equipment & Material List	P	1.51								
C23	Design Completion	P	1.51								

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Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
C24	Design Reviews	P	1.51								
C25	Interface Planning and Control	P	1.51								
C26	Operating, Maintenance & Reliability (OMR) Concepts	P	1.51								
C27	Safeguards and Security	P	1.51								
C28	Heat and Material Balances	P	1.51								
C29	Reliability, Availability, Maintainability & Inspectability (RAMI) Analysis	P	1.51								
C30	Materials Loading/Unloading/Staging	P	1.51								
C31	Constructability and Construction Planning	H	3.2								
C32	Sustainable Design	P	1.51								
C33	Transition and Startup Planning	H	3.2								

APPENDIX D
Project Definition Rating Index Traditional Construction Projects(Nuclear, Non-Nuclear), Scoring Sheet

Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
C34	Operations Plans and Procedures	P	1.51								
Subtotal Scope/Technical Element											
D. MANAGEMENT PLANNING AND CONTROL											
D1	Mission Need Statement	H	2.23								
D2	Acquisition Strategy Plan	H	2.23								
D3	Key Project Assumptions	P	1.66								
D4	Project Execution Plan (PEP)	H	2.23								
D5	Integrated Project Team/Project Organization	P	1.66								
D6	Conceptual Design Report (CDR)	H	2.23								
D7	Baseline Change Control	H	2.23								

APPENDIX D
Project Definition Rating Index Traditional Construction Projects(Nuclear, Non-Nuclear), Scoring Sheet

Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
D8	Project Control	P	1.66								
D9	Project Work Breakdown Structure (WBS)	P	1.66								
D10	Resources Required (People/Material) for Next Phase	P	1.66								
D11	Configuration Management	H	2.23								
D12	Project Risk Management Plan/Assessment	H	2.23								
D13	Quality Assurance Program	H	2.23								
D14	Value Engineering	P	1.66								
D15	Procurement Packages	P	1.66								
D16	Project Acquisition Process	P	1.66								
D17	Integrated Regulatory Oversight Program	P	1.66								
D18	Inter-Site and On-Site Coordination	P	1.66								

APPENDIX D
Project Definition Rating Index Traditional Construction Projects(Nuclear, Non-Nuclear), Scoring Sheet

Rating Element		Weighting Designation	Weighting Factor	Scored Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Score	Maturity Value	Score	Maturity Value	Score	Maturity Value	Score
D19	Stakeholder Program	H	2.23								
D20	Funds Management	P	1.66								
D21	Reviews/Assessments	P	1.66								
Subtotal Management Planning and Control Element											
E. SAFETY											
E1	Hazard Analysis/Safety Documentation	H	9								
E2	Integrated Safeguards and Security Planning	P	6								
E3	ES&H Management Planning (Including ISM)	H	9								
E4	Emergency Preparedness	P	6								
Subtotal Safety Element											
			TOTAL								

MATURITY VALUES*	**N/A**	**0**	**1**	**2**	**3**	**4**	**5**
Definition	Not applicable	Work Not Started	Work Initiated	Concept Defined	Substantive Working Detail	Final Draft	Complete Fully Meets Criteria
Approximate % Complete Range	N/A	0	1% to 20%	21% to 50%	51% to 80%	81% to 95%	96% to 100%

*Application of maturity values may use the definitions section for the highest rating (complete fully meets criteria) and the approximate percent complete ranges shown above (to downscale the rating), as appropriate for the specific rating sub-elements. H = High Weighting P = Prorated Weighting

APPENDIX E
Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
A. COST											
A1	Cost Estimate	H	7.5	1	7.5	2	15.0	5	37.5	5	37.5
A2	Cost Risk/Contingency Analysis	P	3.0	1	3.0	2	6.0	5	15.0	5	15.0
A3	Funding Requirements/Profile	H	7.5	1	7.5	2	15.0	4	30.0	5	37.5
A4	Independent Cost/Schedule Review	P	3.0	N/A	0.0	2	6.0	5	15.0	5	15.0
A5	Life Cycle Cost	P	3.0	1	3.0	2	6.0	4	12.0	5	15.0
A6	Forecast Cost at Completion	P	3.0	1	3.0	N/A	0.0	3	9.0	5	15.0
A7	Cost Estimate for Next Phase Work Scope	P	3.0	5	15.0	5	15.0	5	15.0	5	15.0
Subtotal Cost Element					**39.0**		**63.0**		**133.5**		**150.0**

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
B. SCHEDULE											
B1	Project Schedule	H	7.5	1	7.5	2	15.0	5	37.5	5	37.5
B2	Major Milestones	P	3.0	1	3.0	2	6.0	5	15.5	5	15.0
B3	Resource Loading	P	3.0	1	3.0	1	3.0	4	12.0	5	15.0
B4	Critical Path Management	H	7.5	1	7.5	1	7.5	4	30.0	5	37.5
B5	Schedule Risk/Contingency Analysis	P	3.0	1	3.0	1	3.0	5	15.0	5	15.0
B6	Forecast of Schedule at Completion	P	3.0	1	3.0	1	3.0	5	15.0	5	15.0
B7	Schedule for Next Phase Work Scope	P	3.0	5	15.0	5	15.0	5	15.0	5	15.0
Subtotal Schedule Element					**42.0**		**52.5**		**140.0**		**150.0**
C. SCOPE/TECHNICAL											
C1	Systems Engineering/System Design Descriptions	H	3.2	3	9.6	4	12.8	5	16	5	16

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
C2	Alternative Analysis	H	3.2	5	16	5	16	5	16	5	16
C3	Functional and Operational Requirements	H	3.2	2	6.4	4	12.8	5	16	5	16
C4	Design Basis (How)	H	3.2	2	6.4	4	12.8	5	16	5	16
C5	Design Criteria/Design Margins (How to)	P	1.51	1	1.51	4	6.04	5	7.55	5	7.55
C6	Technology Needs Identified	P	1.51	3	4.53	5	7.55	5	7.55	5	7.55
C7	Technology Needs Demonstrated	H	3.2	2	6.4	4	12.8	5	16	5	16
C8	Trade-Off Optimization Studies	P	1.51	1	1.51	3	4.53	5	7.55	5	7.55
C9	Site Location	P	1.51	3	4.53	4	6.01	5	7.55	5	7.55
C10	Plot Plan	P	1.51	2	3.02	4	6.04	5	7.55	5	7.55
C11	Process Flow Diagrams (PFDs)	P	1.51	N/A	0.0	3	4.53	4	6.04	5	7.55
C12	Natural Phenomena	P	1.51	2	3.02	3	4.53	5	7.55	5	7.55
C13	Layout Drawings and Equipment List	P	1.51	N/A	0.0	3	4.53	4	6.04	5	7.55

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
C14	Piping & Instrumentation Diagrams (P&ID)	H	3.2	N/A	0.0	3	9.60	4	12.8	5	16
C15	Mechanical (Piping)	P	1.51	N/A	0.0	1	1.51	2	3.02	5	7.55
C16	Instrument & Electrical	P	1.51	N/A	0.0	1	1.51	2	3.02	5	7.55
C17	Site Characterization (Including Surveys & Soil Tests)	P	1.51	1	1.51	3	4.53	5	7.55	5	7.55
C18	Waste Characterization and Disposition	H	3.2	1	3.2	3	9.60	5	16	5	16
C19	Pollution Prevention & Waste Minimization	P	1.51	2	3.02	3	4.53	4	6.04	5	7.55
C20	Waste Storage, Packaging and Transportation	H	3.2	2	6.4	3	9.60	5	16	5	16
C21	NEPA Documentation	H	3.2	2	6.4	4	12.8	5	16	5	16
C22	Long Lead/Critical Equipment & Material List	P	1.51	1	1.51	3	4.53	4	6.04	5	7.55
C23	Design Completion	P	1.51	N/A	0.0	1	1.51	2	3.02	5	7.55
C24	Design Reviews	P	1.51	N/A	0.0	5	7.55	5	7.55	5	7.55
C25	Interface Planning and	P	1.51	1	1.51	3	4.53	4	6.04	5	7.55

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Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
	Control										
C26	Operating, Maintenance & Reliability (OMR) Concepts	P	1.51	2	3.02	4	6.04	5	7.55	5	7.55
C27	Safeguards and Security	P	1.51	1	1.51	3	4.53	4	6.04	5	7.55
C28	Heat and Material Balances	P	1.51	N/A	0.0	3	4.53	5	7.55	5	7.55
C29	Reliability, Availability, Maintainability & Inspectability (RAMI) Analysis	P	1.51	N/A	0.0	3	4.53	4	6.04	5	7.55
C30	Materials Loading/Unloading/Staging	P	1.51	1	1.51	2	3.02	4	6.04	5	7.55
C31	Constructability and Construction Planning	H	3.2	N/A	0.0	2	6.4	4	12.8	5	16
C32	Sustainable Design	P	1.51	1	1.51	3	4.53	5	7.55	5	7.55
C33	Transition and Startup Planning	H	3.2	N/A	0.0	3	9.60	4	12.8	5	16
C34	Operations Plans and Procedures	P	1.51	N/A	0.0	1	1.51	3	4.53	5	7.55
Subtotal Scope/Technical Element					**94.02**		**227.5**		**311.4**		**350**

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
D. MANAGEMENT PLANNING AND CONTROL											
D1	Mission Need Statement	H	2.23	5	11.15	5	11.15	5	11.15	5	11.15
D2	Acquisition Strategy Plan	H	2.23	3	6.69	5	11.15	5	11.15	5	11.15
D3	Key Project Assumptions	P	1.66	3	4.98	4	6.64	5	8.3	5	8.3
D4	Project Execution Plan (PEP)	H	2.23	1	2.23	3	6.69	5	11.15	5	11.15
D5	Integrated Project Team/Project Organization	P	1.66	2	3.32	3	4.98	5	8.3	5	8.3
D6	Conceptual Design Report (CDR)	H	2.23	N/A	0.0	5	11.15	5	11.15	5	11.15
D7	Baseline Change Control	H	2.23	1	2.23	4	8.92	5	11.15	5	11.15
D8	Project Control	P	1.66	N/A	0.00	3	4.98	5	8.3	5	8.3
D9	Project Work Breakdown	P	1.66	1	1.66	4	6.64	5	8.3	5	8.3

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
	Structure (WBS)										
D10	Resources Required (People/Material) for Next Phase	P	1.66	5	8.3	5	8.3	5	8.3	5	8.3
D11	Configuration Management	H	2.23	1	2.23	3	6.69	5	11.15	5	11.15
D12	Project Risk Management Plan/Assessment	H	2.23	2	4.46	3	6.69	5	11.15	5	11.15
D13	Quality Assurance Program	H	2.23	1	2.23	4	8.92	5	11.15	5	11.15
D14	Value Engineering	P	1.66	1	1.66	3	4.98	5	8.3	5	8.3
D15	Procurement Packages	P	1.66	N/A	0.0	1	1.66	2	3.32	5	8.3
D16	Project Acquisition Process	P	1.66	5	8.3	5	8.3	5	8.3	5	8.3
D17	Integrated Regulatory Oversight Program	P	1.66	2	3.32	4	6.64	5	8.3	5	8.3
D18	Inter-Site and On-Site Coordination	P	1.66	2	3.32	3	4.98	5	8.3	5	8.3
D19	Stakeholder Program	H	2.23	2	4.46	4	8.92	5	11.15	5	11.15
D20	Funds Management	P	1.66	5	8.3	5	8.3	5	8.3	5	8.3
D21	Reviews/Assessments	P	1.66	5	8.3	5	8.3	5	8.3	5	8.3

APPENDIX E

Project Definition Rating Index Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project Phase

Rating Element		Weighting Designation	Weighting Factor	Expected Target Values At End of Project Phase							
				Pre-Conceptual (CD-0)		Conceptual Design (CD-1)		Preliminary Design Performance Baseline (CD-2)		Final Design (CD-3)	
				Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score	Maturity Value	Target Score
Subtotal Management Planning and Control Element					**87.1**		**155**		**195**		**200**
E. SAFETY											
E1	Hazard Analysis/Safety Documentation	H	9	2	18	4	36	5	45	5	45
E2	Integrated Safeguards and Security Planning	P	6	1	6	4	24	4	24	5	30
E3	ES&H Management Planning (Including ISM)	H	9	2	18	4	36	4	36	5	45
E4	Emergency Preparedness	P	6	1	6	2	12	4	24	5	30
Subtotal Safety Element					**48**		**108**		**129**		**150**
			TOTAL		**310**		**606**		**909**		**1000**

MATURITY VALUES*	**N/A**	**0**	**1**	**2**	**3**	**4**	**5**
Definition	Not applicable	Work Not Started	Work Initiated	Concept Defined	Substantive Working Detail	Final Draft	Complete Fully Meets Criteria
Approximate % Complete Range	N/A	0	1% to 20%	21% to 50%	51% to 80%	81% to 95%	96% to 100%

*Application of maturity values may use the definitions section for the highest rating (complete fully meets criteria) and the approximate percent complete ranges shown above (to downscale the rating), as appropriate for the specific rating sub-elements. H = High Weighting P = Prorated Weighting

Appendix F - Project Definition Rating Index - Construction Project Definitions and Target Score Criteria

The following definitions describe the criteria required to achieve a maximum rating or maturity value of 5. It should be assumed that maturity values of 0-5 represent a subjective assessment of the quality of definition and/or the degree to which the end-state or maximum criteria have been met, or the product has been completed in accordance with the definition of maturity values.

<table>
<tr><th colspan="2">Appendix F - Rating Element</th><th>Criteria for Maximum Rating</th></tr>
<tr><td colspan="3">A. COST</td></tr>
<tr><td>A1</td><td>Cost Estimate</td><td>A cost estimate has been developed and formally approved by FPD and is the basis for the cost baselines. The cost estimate is a reasonable approximation of Total Project Costs (TPCs), and covers all phases of the project. The estimate is prepared in accordance with DOE requirements. The estimate bases are fully documented and traceable. Supporting backup information has been collected and organized and is available in a central file or location. Major estimate assumptions, especially those affecting major cost drivers, are fully documented and explained. Estimate exclusions or qualifications are clearly documented. Estimated costs are time-phased and escalated using current DOE or other justifiable escalation rates. For cost estimate point values AACEI Cost Recommended Practice 17R-97 is a useful reference. A Class I (PDRI score of 5) estimate is developed from quantity take offs from completed design plans and specifications. Whereas the Class 5 estimate (PDRI score 1) is of a rough order of magnitude estimate useful for determining the range of costs for various alternatives at CD-0.
<table>
<tr><th>Project Phase (DOE O 413.3A)</th><th>Level of Project Definition</th><th>Estimate Class

(AACE Recommended Practice No. 17R-97)</th><th>PDRI Maturity Value</th></tr>
<tr><td>CD-0 /Approve Mission Need</td><td>0% to 15%</td><td>Class 4/5</td><td>1</td></tr>
<tr><td>CD-1 /Approve Alternative Selection & Cost Range</td><td>10% to 40%</td><td>Class 3</td><td>2</td></tr>
<tr><td>CD-2 /Approve Performance Baseline</td><td>30% to 70%</td><td>Class 2</td><td>3-4</td></tr>
<tr><td>CD-3 /Approve Start of Construction</td><td>50% to 100%</td><td>Class 1</td><td>5</td></tr>
</table></td></tr>
<tr><td>A2</td><td>Cost Risk/Contingency Analysis</td><td>The cost estimate includes contingency allowances developed in accordance with DOE guidance. In addition to any deterministic contingency analyses that may have been developed, a probabilistic risk analysis has been performed. The assumptions, rationale and methodology used to perform the probabilistic analysis are explained. The cost risk analysis builds on and is tied to the Project Risk Management Plan. Risk mitigation costs, if appropriate, have been included in the baseline cost estimate, or addressed by the risk analysis model. Costs related to schedule contingency also are included. The use of management reserve by contractors in procurement actions has been evaluated. The confidence level of the baseline cost estimate is clearly stated and explained. All of the preceding requirements are documented in the project record.</td></tr>
</table>

	Appendix F - Rating Element	Criteria for Maximum Rating
A3	Funding Requirements/Profile	Funding requirements have been defined and the project timeline is in compliance with the DOE budget timeline/process. Required budget documentation, including Project Data Sheets (where required), reflects current project cost and schedule estimates/forecasts. The funding profile is based on quantified resource requirements derived from the cost estimate, time-phased through integration with the project baseline schedule. Resource constraints (personnel, budget authorizations, etc.) have been considered when developing the project schedule, and an iterative process used to correlate the cost estimate, schedule and funding profile. The funding profile is based on full consideration of available or expected budget or funding levels for the project. The impact of any projected funding shortfalls has been assessed and management strategies developed to accommodate those shortfalls have been considered and incorporated in the project plans. All of the preceding requirements are documented in the project record.
A4	Independent Cost/Schedule Review	In addition to any internal cost and schedule estimate reviews, the cost estimate and schedule have been subjected to an independent review by an organization not directly involved with the project (Independent Cost Estimate, when required). The independent review has been documented, including the techniques used and type of review performed. The results, findings and recommendations of the independent review have been reconciled with the cost and schedule estimates and changes have been incorporated.
A5	Life Cycle Cost	The project Life Cycle Costs (LCC) includes relevant assumptions, bases of estimate, qualifications, and exclusions. LCC includes the estimated cost for government commitments that result from execution of this project, including downstream projects/facilities and eventual disposition of the facilities constructed for this project. The LCC estimate should meet the requirements of Office of Management and Budget directives and DOE Orders and guidance. LCC of competing projects or alternative strategies are estimated and documented on a comparable basis. For nuclear projects, or other projects with significant safety hazards, accidents mitigation costs associated with structures, systems, and components (SSCs) have been included. For high hazard facilities, safety mitigation costs are often a key discriminator in competing projects or alternatives.
A6	Forecast of Cost at Completion	The cost baseline is approved and the measurement of actual performance is begun, forecasts of costs at completion (actual costs to-date plus “to-go” costs) are developed and issued at regular intervals. Cost forecasts are developed in accordance with project procedures. Key assumptions supporting the baseline estimate are documented and periodically re-evaluated and the impacts of changing assumptions are reflected in the estimates of “to-go” costs. Forecasts are related to the Change Control system and incorporate both approved and pending changes, as appropriate. The forecast of cost at completion is a reasonable projection based on the status of the project and experience to-date.
A7	Cost Estimate for Next Phase of Work	A detailed cost estimate is prepared and approved for the work scope to be accomplished during the next phase of the project (i.e., the efforts needed to successfully complete the prerequisites for the next Critical Decision). Cost estimates are defensible with an appropriate level of supporting detail and documentation. Assumptions are clearly documented and stated.

Appendix F - Rating Element		**Criteria for Maximum Rating**
B. SCHEDULE		
B1	Project Schedule	A schedule has been developed, documented and approved by DOE, is identified in regulatory milestones, and is the basis for the Schedule Baseline. The schedule is a reasonable layout of project activities for all phases of the project and is at a level of development that will allow project execution. Included project activities are consistent with the Work Breakdown Structure (WBS), and the schedule is prepared in accordance with DOE guidance and practices. The schedule is activity-based and includes milestones, reasonable durations and acceptable logic. Schedules and milestones should align after negotiations and change packages are complete. Lower level schedules are developed and tiered to support the baseline schedule and/or Project Master Schedule. Project-specific conditions are included. Assumptions are defined. Interface requirements (including technology development and Government Furnished Services and Items (GFSI) are incorporated into the schedule. The baseline schedule covers the full scope of the project through CD-4, including the startup and transition to operations phases. An appropriate method of developing the schedule is used, including an acceptable software package such as P-3, when applicable. The project schedule has undergone an independent documented check for completeness and accuracy.
B2	Major Milestones	Milestones are included at each level of the project schedule to establish a baseline and indicate significant progress against the work to be completed. Stakeholder and regulatory milestones are included, as appropriate. Milestones are tiered to support project decisions, performance, approvals, etc. A milestone dictionary is provided which defines the requirements for successful completion. An appropriate number of milestones are included to control the project.
B3	Resource Loading	The schedule is resource loaded, considers critical resources, and is consistent with the funding profile. The resource loading is documented, and is reasonable, considering such elements as ramp-up, lead times, constraints, etc.
B4	Critical Path Management	A Critical Path is defined. Near-Critical Path activities are identified and sensitivity analyses have been conducted. Schedule management practices are properly focused on Critical Path and Near-Critical Path activities.
B5	Schedule Risk/Contingency Analysis	A probabilistic risk assessment has been conducted on the baseline schedule, and appropriate contingency added, as required. Assumptions, rationale, and methodology, used in the analysis are documented. Schedule risks are fully integrated with the risk management plan.
B6	Forecast of Schedule Completion	The schedule baseline is approved and the measurement of actual performance has begun, forecasts of completion dates are developed and issued at regular intervals in addition to presentations of schedule progress. Schedule forecasts reflect actual performance, to date, and projections. Forecasts are related to the Change Control system and incorporate both approved and pending changes.
B7	Schedule for Next Phase of Work	A detailed schedule is approved for activities to be accomplished during the next phase of the project (i.e., the efforts needed to successfully complete the prerequisites for the next Critical Decision). The schedule is defensible with an appropriate level of supporting detail and documentation.

Appendix F - Rating Element		Criteria for Maximum Rating
C. SCOPE/TECHNICAL		
C1	Systems Engineering /System Design Descriptions	Systems engineering is used to transform mission operational requirements or remediation requirements into system architecture, performance parameters, and design details. Beginning with the definition of a need, the systems engineering process is viewed as a hierarchy that progresses through a baseline and ends with verification that the need is met, including interfaces, fit, and completeness. The application of systems engineering to a project is tailored to the project's needs and documented. System Design Descriptions (SDD) have been prepared and kept updated to include flow-down of safety and non-safety requirements, and design features shown on design drawings, including safety functions and waste streams/interfaces. SDDs identify the analysis and tests which demonstrate that the design satisfies requirements and performance criteria. Flow charts of major systems have been mapped. Monitoring and surveillance have been established to track successful execution. Related systems are successfully integrated. Appropriate safety considerations have been applied on a system-wide basis. These activities should be conducted in accordance with DOE's expectations for incorporating safety into the design process as prescribed in DOE STD 1189-2008, Integration of Safety into the Design Process; and DOE O 420.1B, Facility Safety, as they may apply and appropriate. An independent review has been conducted by a team with appropriate experience and engineering disciplines. Comments have been documented, as well as actions taken for disposition of the comments.
C2	Alternatives Analysis	A subset of reasonable project alternatives/viable alternatives has been determined by means of a documented screening analysis. Major alternatives have been identified and viable alternatives have been analyzed. Alternative Analysis includes comparisons of LCC, Feasibility (including Technology Development requirements), Stakeholder Values, Safety, Regulatory Compliance, constructability and other factors, as appropriate. Life-cycle costs should include costs for structures, systems and components (SSCs) needed to mitigate hazards, as well as life-cycle costs associated with operations and maintenance of the SSCs. The preferred option(s) is identified and justified. The overall condition and status of the facility at project completion (end state) is defined. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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C3	Functional and Operational Requirements (F&ORs)	Within Project Management, F&ORs translate program requirements into design products at the early stages of project development. Project technical requirements are translated from the mission need statement, to program requirements, to F&ORs, to design criteria, and finally documented in Facility/System Design Descriptions. The F&OR will describe the processes and systems that should be included in a project to meet program requirements and fulfill program capabilities articulated in the program mission statement. To contrast to an F&OR in project management, in safety basis, functional requirements define design requirements necessary to support the safety functions associated with Safety Class (SC) and Significant Safety (SS)-SSCs, e.g., for example facility structure should meet Performance Criteria (PC)-3 seismic design loads. F&ORs and functional requirements for the project is documented, approved (by users, key stakeholders, and the DOE program office as appropriate) and are under configuration control. The process should be part of the safety in design activities as defined by DOE STD1189-2008, as they may apply and appropriate.
C4	Design Basis (How)	The set of requirements that bound the design of systems, structures and components within the facility. These design requirements include consideration of safety, plant availability, efficiency, reliability, and maintainability. Project design basis is developed and reviewed including appropriate level of approval from users, key stakeholders, site management, and DOE. Design Basis has clearly defined key performance expectations and provided a sound framework for subsequent design activities, including the regulatory context. Design basis has been peer reviewed by appropriate technical experts. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C5	Design Criteria/Design Margins (How to)	Design Criteria have been clearly defined and quantified including the specification of applicable codes and standards. Design Margins for all structures, systems and components must also be specified. The facility (including safety class and safety significant SSCs) Safety Design Criteria [e.g. DOE O 420.1(b)] have been clearly defined and quantified. Margins for safety design criteria must also be specified. Design criteria for worker safety, security and safeguards have been clearly defined, including the Design Criteria that address the Design Basis Threat. Design Criteria must address both Material Control and Accountability. Design Margins must also be addressed. Requirements and guidelines that govern design of the project have been reviewed by users and appropriate discipline experts and the criteria have been approved. Design margins to cover contingency in the design itself have been reviewed and approved, and placed under configuration control. Criteria include items such as: 1. Regulations, 2. DOE Orders, 3. Codes and Standards (Federal, State and local), 4. Engineering Standards (DOE and contractor); functional performance. These activities should be conducted in accordance with DOE's expectations for incorporating safety into the design process as prescribed in DOE STD 1189-2008, Integration of Safety into the Design Process; and DOE O 420.1B, Facility Safety, as they may apply and appropriate.

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C6	Technology Needs Identified	Availability of new technology for the project is established, the technology has been evaluated, including benefits and risks. Technology development requirements for each alternative are documented. Deployment of a new technology for the project should be part of the project risk assessment and is reflected in the project schedule and cost estimate. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C7	Technology Needs Demonstrated	New technology has been tested and determined to meet project objectives (technical, cost and schedule). Maturity of new technology to be used has been evaluated and factored into risk analysis by means of a Technology Readiness Assessment, or its equivalent (Reference: DOE G 413.3-4, *Technology Readiness Assessment Guide,* dated 10-12-09). An evaluation of the inappropriateness of existing technology has been documented to justify the need. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C8	Trade-Off/Optimization Studies	The Trade-Off Studies are performed, as needed, to reach a reasonable level of project risk consistent with project phase and overall project cost/schedule. These trade-off studies are a part of conceptual and later design phases to optimize the design of the selected alternative. The studies include alternative design and process controls, and optimization approaches with consideration of technical safety requirements. The studies conducted should be well documented and the conclusions justified. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C9	Site Location	The geographical location of proposed project is defined and approved. The rationale for the decision process is documented, as appropriate. The site selection process is considered a viable option and relative strengths and weaknesses of alternate site locations were assessed. The selection criteria are complete and include major considerations of stakeholders and current operations.
C10	Plot Plan	Plot plan is complete and shows location of the project in relation to adjoining facilities. It should include items such as: ▪ Plant grid system with coordinates ▪ Project boundaries ▪ Gates and fences ▪ Off-site facilities ▪ Tank farms ▪ Green space ▪ Buildings ▪ Major pipe racks ▪ Laydown areas ▪ Construction/fabrication areas ▪ Major utilities ▪ Temporary staging areas ▪ Surface water ▪ Nearby residences ▪ Roads and access ways ▪ Rail facilities ▪ Decontamination areas

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C11	Process Flow Diagrams (PFDs)	All major systems have associated process flow diagrams showing the entire process, from beginning to end, including raw materials and waste products. Process flow diagrams are complete and annotated with material balances for design basis. Drawings include items such as: System Major equipment items and major system components System Flow of materials to and from the major equipment items - Inter-relationship of all systems and system elements PFDs reviewed, approved and issued with at least Rev. 0 statuses - as an engineering control document. Any changes to process flow diagrams identified during final design effort are reflected in revised drawings. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C12	Natural Phenomena	Architectural, civil/structural, seismic and other natural phenomena design plans and specifications are in compliance with established standards of practice and are documented. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C13	Layout Drawings and Equipment List	All engineered equipment and/or materials are fully specified, bid, and tabulated, as necessary, to support the project schedule. Long-lead items has been identified and documented with supporting technical basis. Equipment having safety functions is identified with appropriate quality levels. Drawings are comprehensive, reasonable, and show all major elements in a logical format. Individual drawings for major systems are shown in consistent orientation and scale. Layout and major equipment location/arrangement drawings that identify locations of each item of equipment are complete and finalized. All appropriate parties affected by equipment placement (operations, maintenance, etc.) have had the opportunity to provide input and have reviewed the layout. The facility, systems and major component equipment list is complete. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C14	Piping & Instrumentation Diagrams (P&ID)	The final version of revised P&IDs is available. The P&ID have been issued as a configuration control document. P&IDs include all changes identified from the preliminary hazard analysis (PHA), and the maintenance and operations review. The diagrams show piping, valves with tag numbers, piping tie-ins to existing lines, discharge and monitoring points, utilities and storage tanks/sumps. Comprehensive reviews are complete and results incorporated. Examples of these reviews include (but are not limited to), Safety Analysis Reports, maintenance and operations requirements, and final construction and fabrication detail reviews. The P&ID drawings have been independently reviewed and approved. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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C15	Mechanical (Piping)	Process/mechanical design plans and specifications are approved and issued for construction, as appropriate, include: ▪ Mechanical Design ▪ Mechanical Equipment List ▪ Piping Specialty Items List ▪ Piping system criteria ▪ Valve List with tag numbers ▪ Tie-in List for all piping tie-ins to existing lines ▪ Piping stress analysis ▪ Specifications (design, performance, manufacturing, material, and code requirements) ▪ Utility flow diagrams ▪ Utility Sources with supply conditions
		The plans and specifications have been independently reviewed and approved and placed under configuration control. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C16	Instrument and Electrical	The National Electrical Code and state and local relevant codes are incorporated into the design and project plans. Safety and security components have appropriate designations and separation criteria have been considered in their design. Instrument and Electrical requirements, as appropriate, including the following, are approved and issued for construction: ▪ Electrical Area Classifications ▪ Substation Requirements ▪ Electrical Design Requirements ▪ Electrical One-Line Diagrams ▪ Utility flow diagrams ▪ Instrument Set Point document ▪ Substation Design ▪ Instrument Index ▪ Logic Diagrams ▪ Instrument and Electrical Specifications ▪ Utility sources with supply conditions
		The plans and specifications have been independently reviewed and approved and placed under configuration control. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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C17	Physical Site Characteristics	Assessments of site-specific attributes are complete. Survey and geotechnical evaluations of the proposed site are complete. Investigation and development of site-specific characteristics are sufficient to support final Natural Phenomena Hazard design basis and key assumptions are clearly documented. Remediation plan to address identified site characterization deficiencies has been developed, if appropriate. Areas of potential risk are identified. Evaluation and results of the investigation characterize the following: ▪ Hydrology ▪ Geology ▪ Seismic ▪ Underground obstructions and utilities ▪ Environmental contamination ▪ Geotechnical attributes
		The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C18	Waste Characterization and Disposition	Waste streams generated (gaseous, solid, and liquid, both hazardous and non-hazardous) through construction, demolition, or building preparations are sufficiently characterized to identify appropriate disposition alternatives and worker protection levels and documented in a Waste Management Plan. Samples have been collected, analyzed and validated to produce reliable, high quality data. Necessary plans and actions have been taken to confirm conditions, prepare documents and perform the discovery action, including resolving surveillance and monitoring activities and safety considerations. Historical data and process knowledge are fully documented. All waste streams have their disposition finalized and included in the project costs, risks and schedule. The on-site or off-site Waste Acceptance Criteria are documented, approved, and included in the design requirements for the project.
C19	Pollution Prevention and Waste Minimization	A detailed waste minimization/pollution prevention plan for the project and operational phase is complete. A description, estimated costs, and present implementation plan for design, operation, and mitigation features that will minimize wastes and prevent pollution are approved. A detailed waste management plan describing quantities and types of wastes to be generated and plans for their waste treatment, storage or disposal are complete. The plan should: ▪ Support the waste management cost estimate for the process as well as any facilities. Estimated costs considered in Critical Decision process.) ▪ Identify project options for waste treatment, storage, and disposal, including availability of future disposal capacity and sites. ▪ Integrate waste management plans with waste minimization/pollution prevention plans. ▪ Characterize regulatory benefits and concerns associated with types and quantities of wastes expected.
C20	Waste Storage, Packaging and Transportation	Storage, packaging and transportation requirements for nuclear and hazardous materials and wastes are identified and documented, including both off-site and in-plant transportation, as well as methods and equipment (casks, overpacks, etc.) for packaging, receiving/shipping materials (e.g., rail, truck, air, marine). The waste packaging and shipping requirements are identified, documented and included into the project design. Storage areas have required permits. Storage, packaging, and transportation specifications are fully identified for each waste stream.

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C21	NEPA Documentation	Major environmental regulations are identified. Potential environmental permitting issues have been identified. Strategy for addressing environmental permitting issues is defined and documented. Environmental permitting authorities have been contacted and briefed on potential releases to the environment, and the project approach to meeting requirements for air emissions, water discharges, land disposal, and disposition of waste streams. Requirements have been defined and incorporated into design criteria for air emissions, wastewater discharges, land disposal of hazardous wastes, and disposition wastes. Structures, systems, and components are designed consistent with approved environmental permitting requirements. All wastes have a path forward for ultimate disposition. Structures, systems and components in the final design drawings are consistent with approved environmental permitting requirements. All NEPA activities, including NEPA strategy and requirements, are complete and compliant with DOE Orders, as necessary.
C22	Long Lead/Critical Equipment & Materials List	The need for long-lead items and critical equipment has been documented. Long-lead items are listed. Procedures for their acquisition, vendors, and impacts on the schedule have been documented. Any necessary R&D prior to ordering, fabrication or installation has been integrated to the project scope, risks, schedule and costs.
C23	Design Completion	Design drawing needed to support construction and system/equipment/component procurements are complete and should include (among others as required): general arrangements and site layout drawings; architectural drawings; structural drawings; mechanical (HVAC, fire protection) drawings; special process equipment design drawings (build to print); piping drawings; electrical drawings; instrumentation and control drawings; process flow diagrams; and arrangements showing the limits of any existing facility demolition. A complete listing of design specifications for structures, systems and components (SSCs) has been developed which contains requirements to construct, procure, fabricate, install and test. Any drawings which are intended to provide specification requirements for SSCs procurements have been identified. Drawings have been checked and reviewed by an independent team with appropriate experience and engineering disciplines. Comments and resolutions have been documented and accepted by reviewers. Back-up files include engineering files, trade-offs, calculations, etc. Safety is integrated into the design. The design authority has signed off on all design drawings. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C24	Design Reviews	Design reviews have been conducted at each appropriate project phase (at a minimum i.e., Conceptual, Preliminary and Final Design). They have been performed by a multi-functional team representing appropriate disciplines and, if appropriate, external experts have been utilized. Review results, comments and resolutions have been documented and accepted by reviewers. Safety issues have been resolved. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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C25	Interface Planning and Control	System interfaces (consistent with System Design Descriptions) have been identified and defined, and, if necessary, an Interface Control Plan is approved and implemented. All internal and external stakeholders have been involved in project development and planning. Appropriate ties to project logic have been accomplished for each stakeholder (i.e., material receipt, transportation, safeguards and security, safety, worker's health, regulatory, effect on current operations, etc.). The process should be part of the safety in design activities as defined by DOE STD 1189-2008; DOE 440.1B, May 2007, Worker Protection Program for DOE; 10 CFR 851, Worker Safety and Health Program; as they may apply and appropriate.
C26	Operating, Maintenance, and Reliability (OMR) Concepts	OMR concepts are approved and appropriately documented in the design. Operations personnel are involved with the development of OMR requirements and these requirements have been incorporated/considered in the design development. The process should be part of the safety in design activities as defined by DOE STD 1189-2008; DOE 440.1B, May 2007, Worker Protection Program for DOE; 10 CFR 851, Worker Safety and Health Program; as they may apply and appropriate.
C27	Safeguards and Security	Major safeguards and security issues were identified and documented in the Mission Needs Statement. An initial security vulnerability assessment and a cyber security plan were prepared for the project. Security system design requirements based on performance requirements of the Graded Security Protection Policy, DOE O 470.3B, have been identified and incorporated into the project. The final security vulnerability assessment report and cyber security plan were approved and placed under configuration control. At the conclusion of the final design, all safeguard and security requirements as required by DOE M 470.4 series directives are satisfied by the facility design and/or proposed operational features.
C28	Heat and Material Balances	The heat and material balance calculations needed to design and size major plant equipment have been completed. All calculations needed to conduct a Hazard Analysis of the Preliminary Design for major equipment and process operations (substantiate the key flow rates in process flow diagrams) have been completed. The heat and balances calculations have been independently reviewed. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
C29	Reliability, Availability, Maintainability and Inspectability (RAMI) Analysis	A high level RAMI analysis is performed for each of the reasonable/viable project alternatives. Design features needed to mitigate impact to workers have been considered and results documented. A RAMI analysis (to include trade-off studies) has been performed to ensure the equipment selected and the design configuration represents the optimal system to meet throughput and other mission requirements at both the high and lower system levels. The RAMI analysis has been reviewed by an independent team with RAMI experience and review comments are documented and disposed with supporting rationale. Results of the RAMI have been incorporated into the technical baseline. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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C30	Materials Loading/Unloading/Staging	There is a complete list of requirements for loading, unloading, and staging of raw materials and products along with their specifications including cranes and remote handling equipment for the installation/removal or operation of process equipment. This list should include such items as: ▪ Material Safety Data Sheets created ▪ Instantaneous and overall loading/unloading rates ▪ Details on supply and/or receipt of containers and vessels ▪ Storage facilities to be provide and/or utilized ▪ Specification of any required special isolations provisions ▪ Specification for process handling equipment, including robotics, remote devices and cranes
C31	Constructability and Construction Planning	A constructability assessment has been performed. The assessment of alternatives should consider the technical construction challenges and resources required by various alternatives. The constructability assessment has been documented and independently reviewed. Construction planning has been completed and performed by personnel with construction experience on similar projects and documented as part of the final design review.
C32	Sustainable Design	Leadership in Energy and Environmental Design (LEED) target level (i.e. silver, gold) has been selected and a set of energy efficient and sustainable design features have been identified. Requirements consistent with the selected LEED design features have been incorporated into the design criteria. Final energy efficient design features derived from the LEED target level (i.e. silver, gold) have been identified in the design criteria and the design drawings.
C33	Transition and Startup Planning	Project strategy addresses critical issues for transition from construction/restoration to startup/testing to operations, if appropriate. Project transition strategy is finalized. “Cold Start-Up” and “Hot Start-Up” planning sufficiently complete to include identification of sub-system and system testing required, indicating and recording instrumentation required to monitor and assess test performance, and schedule duration and costs needed to successfully conduct the tests. There is an appropriate start-up plan for transition to operation, including maintenance and inspection schedules, reliability testing and monitoring, and documentation. Resources are appropriately identified and integrated into the project schedule. At a minimum, the following critical issues are addressed: ▪ Subsystem/system turnover criteria and documentation ▪ Test acceptance criteria ▪ Turnover (transition) security issues (such as access control and subsystem/system isolation) ▪ Craft jurisdictional issues ▪ Integrated testing plans, etc. ▪ Operational, process engineering, and maintenance personnel readiness for project operations. ▪ Start-up organization established; roles, responsibilities and authority established and defined

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C34	Operations Plans and Procedures	Operating plans and procedures are defined and development plans are in place, including operating procedures that reference technical specifications and administrative limits, as necessary. Monitoring and training requirements for operations are in place, if appropriate. Training input and planning is developed. Disposition considerations and training requirements are defined, approved, and incorporated, as appropriate. Simulation and mockup facilities are defined and established, as necessary. If applicable, processing and production plans and schedules are in place and include such items as: ▪ All production/characterization/sampling steps are identified and integrated ▪ Assumed throughput and production efficiencies are defined and reasonable ▪ Assumptions are supported by time and motion studies, calculations and operating experience ▪ Resource requirements for each step identified ▪ Failure/reject rate assumptions documented and supported ▪ Equipment and material needs including availability and reliability defined ▪ Initial production plan formulated ▪ Design approach has optimized processing and production objectives considering spare capacity
D. MANAGEMENT PLANNING AND CONTROL		
D1	Mission Need Statement (MNS)	An approved Mission Need Statement exists. The project MNS demonstrates that the project relates to and supports execution of Program Strategic Plan goals and objectives as well as the DOE Strategic Plan. A MNS describes shortfalls or performance gaps between the current gaps and the required state. It articulates DOE expectations for safety in design based on a pre-conceptual hazard analysis and categorization, when applicable and appropriate, as prescribed in DOE STD 1189-2008. Mission needs are reassessed after major changes in a program, at budget submission, and at Critical Decisions.
D2	Acquisition Strategy/Plan	An Acquisition Strategy/Plan has been developed and approved in accordance with DOE requirements and orders. The acquisition strategy and plans should be sufficient to accomplish the project using a tailored approach, as appropriate. The project is in compliance with the site/complex strategic plan. The approved Acquisition Strategy supports all contracts, subcontracts, long lead procurements, and major procurements (both foreign and domestic) for the project. The plan addresses the methodology of incorporating project specific issues [such as, nuclear quality assurance-1 (NQA-1)].
D3	Key Project Assumptions	A complete list of critical facts and circumstances that would affect project outcome if changed is available. These assumptions have been reviewed and approved by appropriate parties. Project assumptions are reflected in technical/cost/schedule baselines and risk management plans. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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D4	Project Execution Plan (PEP)	The PEP has been developed and approved in accordance with DOE requirements/orders. The PEP is the primary agreement on project planning and objectives between all parties, and establishes roles and responsibilities and defines how the project will be executed, including tailoring general requirements and processes to the specifics of the project. The PEP should include: • Performance Baseline (Scope, Cost and Schedule), including a Resource Loaded Schedule for the duration of the project. • Identification of any long-lead equipment and materials (including the technical basis for equipment sizing as well as a risk analysis with respect to long-lead equipment being properly sized). • Project organization and roles and responsibilities. • Process for baseline change control and configuration management. • Discussion of planned design reviews and how they are to be conducted. • Project quality assurance organization and implementation approach. The PEP has been updated to reflect current project status, plans and performance baseline.
D5	Integrated Project Team (IPT) and Charter	The project organization and IPT charter are in place and functioning. The Integrated Project Team (IPT) has been in place since early project phases. The IPT participants' roles and responsibilities are clearly articulated. The composition of the IPT reflects the major areas of expertise needed to execute the project. The project is staffed with sufficient numbers of project management, technical, and acquisition specialists suitably qualified to accomplish project objectives. A qualified (certification level) Federal Project Director has been identified and formally assigned.
D6	Conceptual Design Report (CDR)	The CDR -should have detailed supporting documentation for the recommended alternative, Total Project Cost range, and the system requirements and applicable codes and standards for design and construction, to include environmental, safety and security considerations. Conceptual design drawings have been reviewed by an independent team with appropriate engineering disciplines and relevant experience. Review comments have been documented and disposed with supporting rationale. CDR has been approved by DOE. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
D7	Baseline Change Control	There is a DOE approved process to review and approve proposed changes to cost, schedule, and technical baselines and to determine the impact of changes. Baseline Change Control Boards (CCB) are established at appropriate levels of the organization, the thresholds for each level are defined, and appropriate procedures are in place and being used. The process is described in the Project Execution Plan.
D8	Project Control	A project control system is being used to manage the project baseline applying earned value techniques, variance analysis, contingency/management reserve and effective reporting in accordance with DOE Orders and guidelines.

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D9	Project Work Breakdown Structure (WBS)	Project Work Breakdown Structure is established and reflects the project through completion. WBS dictionary is complete, including a detailed Statements of Work (SOWs). Project schedule and costs directly aligned with WBS structure, and deliverables are defined. The WBS is defined to an appropriate level of detail needed to successfully manage the project.
D10	Resources Required (People/Material) for Next Phase	The resources required for next phase are identified and available. These resources are reflected in the resource-loaded schedule.
D11	Configuration Management	A configuration management program is functioning to ensure consistency among requirements, criteria, design, existing facilities, physical configuration, and interfaces within project documents. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
D12	Project Risk Management Plan/Assessment	A risk management plan is developed and is included in the Acquisition Strategy/Plan and/or PEP, as appropriate. A risk mitigation strategy is in place. Project risk (technical and programmatic) is an accurate and complete estimate of the probability and severity of cost, schedule and other impacts (environment and safety) associated with uncertainties in the project, including a time-frame in which these risks are expected to occur. Risks are tracked, reported, and controlled. Project risks are reflected in the project cost estimate and schedule. Risk Mitigation Plans/Strategies have been identified in the plan and included in the Performance baseline. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate. Risk Management and Ownership continues to be actively used, as demonstrated by periodic (i.e. at least quarterly) updates of the risk register and regular reporting and re-evaluation and status reporting of cost and schedule contingency.
D13	Quality Assurance Program	A quality management system is defined and integrated into the processes governing activities that implement the project mission in compliance with requirements of 10CFR 830 Subpart A, Quality Assurance Requirements, DOE O 414.1C, Quality Assurance, and other applicable project specific quality requirements. A Quality Assurance (QA) program/plan is established. QA factors, including standards, specifications, and limitations are identified and have been communicated to the project staff and contractors. A Quality Control (QC) and QA oversight organization is in place and functioning. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.

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D14	Value Engineering	Where appropriate, a value engineering program complying with DOE Orders is in place and qualified personnel have analyzed appropriate project functions using accepted industry techniques with the aim of improving performance, reliability, quality, safety and life cycle costs of products, systems or procedures. The value engineering analyses are documented in a formal report and have provided unbiased, outside opinion and/or senior expertise (as appropriate) as inputs to the design process and an independent review of concept, design, and schedule. Measures, taken to minimize project cost and maximize the return on investment for delivering the project, have been documented and cost savings have been quantified. Project criteria have been re-evaluated when value engineering analyses have determined them to have poor value or a high cost-to-worth ratio. The process should be part of the safety in design activities as defined by DOE STD 1189-2008, as they may apply and appropriate.
D15	Procurement Packages	Procurement packages are being developed in accordance with the Acquisition Plan and will have added details for Design-Build procurements (if appropriate). Contractor selection processes and procedures are in place. Procurement packages reflect all requirements for security, safety and environmental considerations and pass on appropriate responsibilities and risks to contractors and subcontractors.
D16	Project Acquisition Process	The project is being accomplished in accordance with the established DOE Project Acquisition Process and in compliance with DOE O 413.3A, Program and Project Management for the Acquisition of Capital Assets, including Critical Decisions and Energy System Acquisition Advisory Boards (ESAAB) or the ESAAB-equivalent process.
D17	Integrated Regulatory Oversight Program	Applicable Federal, state, and local government permits, licenses, and regulatory approvals, including strategies and requirements are identified and obtained in a timely manner or milestone dates established. Schedule for receipt of authorization from regulators should be realistic based on experience. Requirements and milestone dates are updated as necessary and kept current. Regulators are stakeholders and have been involved with the project since its planning phase.
D18	Inter-Site and On-Site Coordination	Key inter-site and on-site coordination issues are identified, addressed and resolved or plans are in place to accomplish their resolution.
D19	Stakeholder Program	A stakeholder program was established early in the planning phase of the project to take into account the concerns and ideas of Federal, state and local regulators, local citizens, the project staff, the laboratory, DOE' site office, the Program Office, and other entities involved in the planning, design, or implementation of the project. The stakeholder program includes a mechanism for incorporating stakeholder feedback into the planning process and for communication between the project team and stakeholders in a timely and meaningful way.
D20	Funds Management	A funds management system is in place to ensure funds are allocated to support the project baseline elements for the current fiscal year. A system is in place to periodically review the annual costs to ensure that the annual funding will not be exceeded.

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D21	Reviews/Assessments	Reviews (including External Independent Reviews (EIRs), Independent Project Reviews (IPRs) and Technical-IPRs) and assessments are performed and the findings, assessments, and recommendations are documented and presented to appropriate levels of management. A Corrective Action Plan is in place and being monitored and implemented, as necessary. Appropriate reviews and self-assessments are conducted as an integral part of the project, based on project complexity, size, duration and Critical Decision points.
E. SAFETY AND SECURITY		
E1	Hazard Analysis/Safety Documentation	Addressing hazards early ensures that safety is “designed in” early instead of “added on” later with increased cost and decreased effectiveness. Hazards include both project hazards (such as fire hazards, criticality, radiological, chemical, and explosives), as well Natural Phenomena Hazards such as earthquakes, flood, hurricanes, and lightening. Analysis of hazards results in the identification of potential accident scenarios and the determination of how to prevent or mitigate the accidents. Structures, systems, and components (SSCs) are identified and incorporated into the design to prevent or mitigate the consequences of hazards to the facility worker, the collocated worker and the public. These SSCs are classified as safety class, safety significant, or defense in depth as required by the safety function. Requirements on the Integrated Safety Management System (ISMS) to be followed are described in DOE P 450.4, Safety Management Policy, dated 10-15-96. New nuclear facility design activities or major facility modifications as defined in 10CFR 830, Subpart B, -must be conducted in accordance with DOE O 420.1B, Facility Safety, dated 12-22-05; DOE STD 1189-2008; and 10 CFR 851. The ISMS process is applied to all Critical Decisions (CDs) and the Office of Health, Safety and Security (HSS) activities and documentation (among others as applicable and appropriate) that should be followed by the project are described below: Prior to CD-0 (Mission Need): • Inventory of available documents based on existing facilities/sites identified in the scope of the project to facilitate hazard analysis and project planning. • Identify the potential hazards and their safety and risk implications in the mission need statement. • Include in the mission need DOE expectations for safety in design; identification of Safety in Design Tailoring Strategy; and identification of high level applicable safety regulations, safety codes, and safety standards (e.g. DOE O 420.1B, etc).

Appendix F - Rating Element		Criteria for Maximum Rating
E1	Hazard Analysis/Safety Documentation (continue)	CD-0 to CD-1 (Alternative Selection and Cost Range): • Documented Hazard Analysis of the conceptual design that identifies project hazards and natural phenomena hazards associated with systems for material processing, treatment, storage, and radioactive, chemical, and hazardous waste disposition. • Hazardous conditions and associated likelihoods and consequences, both mitigated and unmitigated for each reasonable alternative are documented. Hazards have been identified for control under safety management programs (Integrated Safety Management System, industrial safety, radiation protection, etc.) or uniquely analyzed under a Design Basis Accident (DBA). • Development of a Safety Design Strategy, Conceptual Safety Design Report, and a Conceptual Safety Validation Report (DOE STD 1189-2008, Sections 2.3 and 4.2) and integrate into project planning documentation. • SSCs that prevent or mitigate the frequency and/or consequences of DBAs associated with project hazards and natural phenomena hazards (NPH) are identified. • Requirements for worker safety, radiation safety, criticality safety, fire safety, industrial safety, and life safety are identified and incorporated into the project Facility and Operational Requirements, and design criteria documentation. • Determine the qualified safety and health professionals in the Integrated Project Team necessary to support the Federal Project Director. CD-1 to CD-2 (Performance Baseline): Safety analysis activities should be integrated and performed concurrently and iteratively with design activities in order to establish an accurate and defendable performance baseline that adequately incorporates nuclear safety basis requirements, as applicable. Safety basis documents that are developed for CD-2 are: • Completed Preliminary Safety Design Report and the Preliminary Safety Validation Report. • Updated Safety Design Strategy • Requirement for worker safety, radiation safety (including ALARA), criticality safety, industrial safety, fire safety, life safety, and chemical safety identified and incorporated into the project design. • The Hazard Analysis Report has been updated, reviewed and approved. CD-2 to CD-3 (Start of Construction): • Completed Preliminary Documented Safety Analysis (PDSA) and the Safety Evaluation Report. • Before the detailed design of the facility is accepted, all design requirements that were generated from safety considerations should be documented in the PDSA. • The Integrated Safety Management Process has been validated for construction activities.

Appendix F - Rating Element		Criteria for Maximum Rating
E2	Integrated Safeguards & Security Planning	The security approach and potential requirements for the project are documented to aid in the development of the integrated safeguard and security plan. Safeguard and security requirements are identified and documented and incorporated into detailed design drawings and specifications. Security levels are appropriate for the designation of the facility as nuclear or non-nuclear.
E3	ES&H Management Planning (including ISMS)	Environmental, safety and health requirements, as delineated in Federal, DOE, state, site and local laws and regulations, are included in the project design requirements. Any exceptions are documented, justified and approved. The requirements, methodology, and responsibility for ES&H activities are clearly communicated. An Integrated Safety Management System (ISMS) has been implemented in support of the project in accordance with the requirements of DEAR 970-5204-2. The site's ISMS Document includes mechanisms for integrating ISM into the project activities and these mechanisms have been implemented. Safety Plans include fire, occupational, radiological, industrial hygiene, etc., and are complete, thorough and an integral part of all design efforts. Site procedures and mechanisms ensure that during the project planning, hazards are analyzed, controls are identified, and feedback and improvement programs are in place and effective. Line managers are using these processes effectively, consistent with their management functions, responsibilities and authorities.
E4	Emergency Preparedness	Emergency planning and preparedness considerations are adequately reflected in the project design and meet emergency preparedness requirements of DOE O 151.1 and DOE O 420.1, where appropriate. Emergency response services and related factors are considered in the facility site selection. Specialized issues and considerations for emergency preparedness are adequately identified and documented. Emergency Preparedness planning is complete for the disposition effort, and post-disposition emergency planning has been initiated, if appropriate. This planning has been coordinated with site and external response organizations. Specialized issues and considerations for emergency preparedness adequately are identified and documented.