The definitions shown below (Table 6 from the CDAT manual) describe the criteria used in Table 7 (in the manual), 2023 EM (CDAT) - Traditional Construction Projects (Nuclear, Non-Nuclear), Target Scores by Project

2023 EM CDAT - Construction Project Definitions and Target Score Criteria					
A. COST - Criteria for Maximum Rating					
A1	Cost Estimate	A cost estimate has been developed and formally approved by FPD and is the basis for the cost baselines. The cost estimate is			
		Project Phase (DOE O 413.3B, or latest version)	**Level of Project Definition**	**Estimate Class**	**CDAT Maturity Value**
		CD-0/Approve Mission Need	0% to 15%	Class 4/5	1
		CD-1/Approve Alternative Selection & Cost Range	10 to 15%	Class 3	2
		CD-2/Approve	30% to 70%	Class 2	04-Mar
		CD-3/Approve Start of Construction	505 to 100%	Class 1	5
A2	Cost Risk/Contingency Analysis	The cost estimate includes contingency allowances developed in accordance with DOE guidance. In addition to any deterministic contingency analyses that may have been developed, a probabilistic risk analysis has been performed. The assumptions, rationale and methodology used to perform the probabilistic analysis are explained. The cost risk analysis builds			
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-			
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,			
A5	Life Cycle Cost	The project Life Cycle Costs (LCC) includes relevant assumptions, bases of estimate, qualifications, and exclusions. LCC			
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			
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.			
B. SCHEDULE - Criteria for Maximum Rating					
B1	Project Schedule	A schedule has been developed, documented, and approved by DOE, is identified in regulatory milestones, and is the basis for			
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			
B3	Resource Loading	The schedule is resource loaded, considers critical resources, and is consistent with the funding profile. The resource loading			
B4	Critical Path	A Critical Path is defined. Near-Critical Path activities are identified, and sensitivity analyses have been conducted. Schedule			
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			
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			
C. SCOPE/TECHNICAL - Criteria for Maximum Rating					
C1	Systems Engineering / System Design	Systems engineering is used to transform mission operational requirements or remediation requirements into system These activities should be conducted in accordance with DOE's expectations for incorporating safety into the design process			
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			
C3	Functional and Operational Requirements	Within Project Management, F&ORs translate program requirements into design products at the early stages of project To contrast to an F&OR in project management, in safety basis, functional requirements define design requirements necessary			
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			
C5	Design Criteria/Design Margins (How to)	Design Criteria have been clearly defined and quantified including the specification of applicable codes and standards. Design criteria for worker safety, security and safeguards have been clearly defined, including the Design Criteria that address Requirements and guidelines that govern design of the project have been reviewed by users and appropriate discipline experts 1. Regulations,			

2023 EM CDAT - Construction Project Definitions and Target Score Criteria		
A. COST - Criteria for Maximum Rating		
		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
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
C7	Technology Needs Demonstrated	New technology has been evaluated 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
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
C9	Site Location	The geographical location of proposed project is defined and approved. The rationale for the decision process is documented,
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 • Green space coordinates • Building • Project boundaries • Major pipe racks • Temporary staging areas • Gates and fences • Laydown areas • Decontamination areas • Off-site facilities • Construction/fabrication • Rail facilities • Tank farm areas • Major utilities • Roads and access ways • Nearby residences • Surface water
C11	Process Flow Diagrams (PFDs)	All major systems have associated process flow diagrams showing the entire process, from beginning to end, including raw • 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
C12	Natural Phenomena	Architectural, civil/structural, seismic, and other natural phenomena design plans and specifications are in compliance with
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
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
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 tine-ins to existing lines • Specifications (design, performance, manufacturing, material, and code requirements) • Piping stress analysis • Utility flow diagrams • Utility sources with supply conditions The plans and specifications have been independently reviewed and approved and placed under configuration control. The
C16	Instrument and Electrical	The National Electrical Code and state and local relevant codes are incorporated into the design and project plans. Safety and • 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

2023 EM CDAT - Construction Project Definitions and Target Score Criteria		
A. COST - Criteria for Maximum Rating		
		• Instrument and Electrical Specifications • Utility sources with supply conditions
C17	Physical Site Characteristics	Assessments of site-specific attributes are complete. Survey and geotechnical evaluations of the proposed site are complete. • Hydrology • Underground obstructions and utilities • Geology • Environmental contamination • Seismic • Geotechnical attributes The process should be part of the safety in design activities as defined by DOE STD 1189-latest version, as they may apply
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
C19	Pollution Prevention and Waste Minimization	A detailed waste minimization/pollution prevention plan for the project and operational phase is complete. A description, • Support the waste management cost estimate for the process as well as any facilities. Estimated costs considered in • Identify project options for waste treatment, storage, and disposal, including availability of future disposal capacity and • 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
C21	NEPA Documentation	Major environmental regulations are identified. Potential environmental permitting issues have been identified. Strategy for Requirements have been defined and incorporated into design criteria for air emissions, wastewater discharges, land disposal
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
C24	Design Reviews	Design reviews have been conducted at each appropriate project phase (at a minimum i.e., Conceptual, Preliminary and Final
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
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-latest version; DOE 440.1 B or latest version, Worker Protection Program for DOE; 10 CFR 851, latest version, Worker Safety and Health Program; as they
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
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
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.
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 • 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
C32	Sustainable Design	Leadership in Energy and Environmental Design (LEED) target level (i.e., silver, gold) has been selected and a set of energy
C33	Transition and Startup Planning	Project strategy addresses critical issues for transition from construction/restoration to startup/testing to operations, if • Subsystem/system turnover criteria and documentation • Test acceptance criteria

2023 EM CDAT - Construction Project Definitions and Target Score Criteria		
A. COST - Criteria for Maximum Rating		
		• 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
C34	Operations Plans and Procedures	Operating plans and procedures are defined, and development plans are in place, including operating procedures that 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
C35	Civil, Structural and Architectural	Architectural, civil/structural requirements; seismic and other natural phenomena design requirements are fully documented. Civil/Structural design plans and specifications are approved and issued for construction. The plans and specifications have
D. MANAGEMENT PLANNING AND CONTROL - Criteria for Maximum Rating		
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
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
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
D4	Project Execution Plan (PEP)	The PEP has been developed and approved in accordance with DOE requirements/orders. The PEP is the primary agreement • 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 • 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
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
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
D8	Project Control	A project control system is being used to manage the project baseline applying earned value techniques, variance analysis,
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
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
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, or
D14	Value Engineering	Where appropriate, a value engineering program complying with DOE Orders is in place and qualified personnel have
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
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, or latest version, Program and Project Management for the Acquisition of Capital Assets, including

2023 EM CDAT - Construction Project Definitions and Target Score Criteria		
A. COST - Criteria for Maximum Rating		
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
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
D20	Funds Management	A funds management system is in place to ensure funds are allocated to support the project baseline elements for the current
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
E. SAFETY AND SECURITY - Criteria for Maximum Rating		
E1	Hazard Analysis/Safety Documentation	Addressing hazards early ensures that safety is "designed in" early instead of "added on" later with increased cost and Requirements on the Integrated Safety Management System (ISMS) to be followed are described in DOE P 450.4, Safety The ISMS process is applied to all Critical Decisions (CDs) and the Office of Health, Safety and Security (HSS) activities and **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 • 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; **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 • Hazardous conditions and associated likelihoods and consequences, both mitigated and unmitigated for each reasonable • Development of a Safety Design Strategy, Conceptual Safety Design Report, and a Conceptual Safety Validation Report • SSCs that prevent or mitigate the frequency and/or consequences of DBAs associated with project hazards and natural • Requirements for worker safety, radiation safety, criticality safety, fire safety, industrial safety, and life safety are • Determine the qualified safety and health professionals in the Integrated Project Team necessary to support the Federal **CD-1 to CD-2 (Performance Baseline):** Safety analysis activities should be integrated and performed concurrently and iteratively with design activities in order to • 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 • 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 • The Integrated Safety Management Process has been validated for construction activities.
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
E3	ES&H Management Planning	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,
E4	Emergency Preparedness	Emergency planning and preparedness considerations are adequately reflected in the project design and meet emergency preparedness requirements of DOE O 151.1D and DOE O 420.1C, or latest versions, where appropriate. Emergency response