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Chemistry & Metallurgy Research Replacement (CMRR)

Definition of Design Maturity – An Approach

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Design Maturity

“Project design will be considered sufficiently mature when the process has developed a cost estimate and all relevant organizations have a high degree of confidence that it will endure to project completion.”

- *Upcoming DOE Order 413*

Projects and DOE need a structure to define maturity levels to effectively communicate status.

Establishing a Boundary Condition Based on Likelihood of Changes

- Maturity levels based on degree of completion of specific engineering and planning documents
- Confidence that change orders are kept to a minimum
- Regardless of completeness of design, changes will occur
- Utilize 1189 Standard Criteria for a major modification to bound definition
 - Design should be sufficiently complete to minimize likelihood of a major modification using 1189 Criteria
 - Reduces risk to successful execution due to design maturity

1189 Major Modification Execution Criteria

Table 8-1 (Major Modification Evaluation Criteria) in the 1189 Standard defines the six evaluation criteria for a determination if a modification is considered a major modification:

1. Add a new building or facility
2. Change in building footprint
3. Change an existing process or addition of a new process resulting in the need for a safety basis change requiring DOE approval
4. Utilize new technology not currently in use or not previously reviewed or approved
5. Create the need for new or revised SSC
6. Involve a hazard not previously evaluated

Design Percent Complete vs. Design Maturity

- Design Percent Complete
 - Tied to EVMS
 - Weighting of products along with effort
 - Effected by execution strategy
 - Can be qualitatively tied to “traditional” definitions
- Design Maturity
 - Requires a definition based on project size, duration and complexity
- Most of the time design percent complete and maturity levels will differ
- Design maturity should lead percent complete of total design effort (conceptual – Title III)
 - There are design deliverables that contribute very little to design maturity

Use of Project Definition Rating Index Criteria to Assess Design Maturity Percentage

- The PDRI supports measurement of project definition (maturity) throughout the project lifecycle
- The section on scope and technical provides criteria to evaluate design maturity
- Weighting factors for assessment should be adjusted depending on project

Maturity Value Table from PDRI

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

- Maturity percentage is summation of products of weighting factors and maturity value divided by total possible points

By Criteria Within Scope and Technical

		Weighting Factor	Maturity Value	Score
1	Systems Engineering/System Design Descriptions	3		
2	Alternative Analysis	2		
3	Functional and Operational Requirements (F&ORs)	3		
4	Design Basis (How)	3		
5	Design Criteria/Design Margins (How to)	3		
6	Technology Needs Identified	2		
7	Technology Needs Demonstrated	2		
8	Trade-Off Optimization Studies	1		
9	Site Location	3		
10	Plot Plan	3		
11	Process Flow Diagrams (PFDs)	3		
12	Natural Phenomena	3		
13	Layout Drawings and Equipment List	3		
14	Piping & Instrumentation Diagrams (P&ID)	3		
15	Mechanical Piping	3		
16	Instrument & Electrical	3		
17	Site Characterization (Including Surveys & Soil Tests)	3		
18	Waste Characterization and Disposition	2		
19	Pollution Prevention & Waste Minimization	2		
20	Waste Storage, Packaging and Transportation	2		
21	NEPA Documentation	3		
22	Long Lead/Critical Equipment & Materials List	3		
23	Design Completion	3		
24	Design Reviews	3		
25	Interface Planning and Control	3		
26	Operating, Maintenance & Reliability (OMR) Concepts	3		
27	Safeguards and Security	2		
28	Heat and Material Balances	3		
29	Reliability, Availability, Maintainability & Inspectability (RAMI)	2		
30	Materials Loading/Unloading/Staging	2		
31	Constructability and Construction Planning	3		
32	Sustainable Design	3		
33	Transition and Startup Planning	3		
34	Operations Plans and Procedures	2		

Proposed Path Forward

- CMRR-NF, UPF, and Bechtel Engineering are jointly drafting details on this approach – for large nuclear projects
- Provide draft approach to EFCOG and OECM/NNSA to review
 - Agreement on approach for CMRR-NF and UPF
 - Decisions/modifications on applicability to smaller projects and environmental management work
 - Note: This approach likely would not apply to science projects
- Following dialog, decision on if and how to promulgate

Questions/Comments