

Grading Configuration Management for Accelerators October 5, 2021

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Presentation Topics

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Objectives and Elements of CM from STD-1073

From DOE-STD-1073-2016, Configuration Management:

- "The basic objectives of CM are the same for all facilities and activities which are to:
 - Establish consistency among design requirements, physical configuration, and documentation (including analysis, drawings, and procedures) for the facility or activity; and
 - (2) Maintain this consistency throughout the life of the facility or activity, particularly as changes are being made."
- "The following five key elements for effective CM are...:
 - Design Control,
 - Work Control,
 - Change Control,
 - Document Control, and
 - Assessments."



What's in DOE O 420.2C for CM?

- Requirements (Section 4.b) and CRD: "an unreviewed safety issue (USI) process. A USI process supports configuration management efforts that helps ensure the facility and supporting safety documentation are maintained current and periodically updated"
- CRD Section 4 on ARRs: "As part of the ARR [Accelerator Readiness Review] process, the contractor must demonstrate to the satisfaction of the Field Element Manager that the following processes are in place:...b. A <u>Facility Configuration Management Program</u> that is related to accelerator safety"



What's in Section 2.7 (CM) of DOE G 420.2-1A Regarding a Facility CM Program?

- "CM systems and safety controls should be consistently managed using a graded approach so that as-built drawings, system and design requirements, and actual field configuration remain consistent, documented, and accurate. An effective CM program typically includes an effective safety documentation program, a records management and a training program, and a maintenance program." (examples of 14 bullets from Section 2.7):
 - "records of design requirements that define the constraints and objectives placed on the credited controls" (design control)
 - "use of current, approved versions of documents to operate, maintain, and modify credited controls" (document control)
 - "control of work activities identified, initiated, planned, scheduled, coordinated, performed, approved, validated, reviewed for adequacy and completeness, and documented" (work control)
 - "change control process for credited controls to maintain consistency among design requirements, physical configuration, and related facility documentation" (change control)
 - "periodic assessments of the credited control CM" (assessments)



What's in Section 3.4 (CM during Operations) of DOE G 420.2-1A Regarding CM?

- Maintaining Credited Controls During Operations
 - "Approved operating procedures should translate the ASE requirements and any other important SAD commitments into language readily understood by all who have assigned responsibility for maintaining credited control operability, including testing, maintenance, and inspections."
- Approved Alternatives for Credited Controls
 - "Approved alternatives are approved actions offering equivalent protection that, when implemented as specified in the ASE, prevent ASE violations and reduce unnecessary impact on operations."
- Performing Maintenance and Return to Service of Credited Engineered Controls
 - "Accelerator operators should use preapproved work plans or procedures for routine maintenance and one-for-one component replacement done on credited engineered controls... For corrective or preventive maintenance that requires modifications to the credited engineered control, accelerator operators should employ a formal review of the proposed work, including completion of the USI process."
- Updates to the SAD During Operations
 - "The SAD and appended updates should accurately reflect the engineered and administrative controls of safety systems at the facility. Operations personnel should be updated regarding changes to the SAD that impact safe operations."



STD-1073 on Accelerators and Grading

- Where STD-1073 discusses accelerator applications it is generally consistent with the Accelerator Safety Guide
- > The following are some key points regarding grading of CM from STD-1073:
 - "...as SSCs and credited controls are removed from the facility or activity and from active status, the contractor should remove them from the list of CM SSCs and credited controls as appropriate.
 - The resolution of a programmatic or technical issue can change the importance of a SSC... When such changes occur, contractors should review their impact on the list of CM SSCs and credited controls and revise it accordingly.
 - In implementing a CM process, contractors should:
 - Take credit for existing programs and procedures where appropriate,
 - Modify existing programs and procedures where necessary, and
 - $\,\circ\,$ Limit the development of new activities to those that are needed."



Grading Example at a Nuclear Facility with no Safety SSCs

- The facility includes a Linatron with energy output less than 10 MeV and doesn't credit any SSCs in the safety analysis. Therefore, the DOE O 420.1C, Facility Safety, CM requirements don't apply and DOE O 420.2C doesn't apply.
- However, it is a Hazard Category 3 nuclear facility and CM is applied in a graded manner. Some engineered controls are identified as "Configured Items" and a CI datasheet (system description) is prepared for each. The CI datasheet is a shorter (graded) version of a System Design Description.
- The following systems have CI datasheets prepared and managed by a System Engineer:
 - Shield Walls
 - Interlock System
 - Radiation Area Monitors and Associated Warning Lights
 - Continuous Air-Monitoring System
 - Fire Detection and Alarm System
 - Seismic Natural Gas Shutoff Valve
 - Building Structure
- The five elements of CM are implemented in a graded manner and the Unreviewed Safety Question Process is implemented.



Some Suggestions for Accelerators

- Identify and maintain the list of CM engineered controls: (1) Highest priority is active engineered credited controls from the ASE; (2) next are passive engineered credited controls from the ASE; (3) then other lower-level engineered controls important to safety and possibly for other considerations, e.g., high cost to replace, important to mission,...
- Consider a phased approach based on control importance
- Limit number of levels of CM grading, i.e., no more than two
- Address the elements of CM in a graded manner using methods from the AS Guide, STD-1073, consensus standards, best practices, and experience from the community
- Use and modify, as needed, existing processes
- Flow CM down into relevant processes and conduct training for affected disciplines
- Address aging degradation and technical obsolescence
- What else?



Backup Slides

• DOE O 420.1C Requirements for CM



What is Required for CM for Existing Nuclear Facilities per DOE O 420.1C, *Facility Safety*? Part 1

- Required for active credited SSCs
- Requirements are as follows:
 - "Safety Importance of the System. Not all systems are equal as measured by the likelihood and consequences of the hazard and the accidents that they prevent or mitigate. The level of system documentation detail in configuration management should be tailored to the importance of the system."
 - "(1) A documented configuration management program must be established and implemented that ensures consistency among system requirements and performance criteria, system documentation, and physical configuration of the systems within the scope of the program... The configuration management program must address:
 - (a) system design documentation;
 - (b) system assessments;
 - (c) control of maintenance;
 - (d) change control; and
 - (e) aging degradation and technical obsolescence."



What is Required for CM for Existing Nuclear Facilities per DOE O 420.1C, *Facility Safety?* Part 2

 "(2) System design documents and supporting documents must be identified and kept current using formal change control and work control processes...Design documentation must include:

(a) system requirements and performance criteria essential to performance of the system's safety functions;

(b) the basis for system requirements; and

- (c) a description of how the current system configuration satisfies the requirements and performance criteria."
- (3) System assessments must include periodic reviews of system operability, reliability, and material condition. Reviews must assess the system for:
 - (a) the ability to perform design and safety functions;
 - (b) physical configuration as compared to system documentation; and (c) system and component performance in comparison to established performance criteria.
- (4) System maintenance and repair and modification must be controlled through a formal change control process to ensure that changes are not inadvertently introduced and that required system performance is not compromised. Post maintenance or modification testing must be conducted to confirm continued capability to fulfill system requirements."