
A NEW TAXONOMY FOR CONFIGURATION MANAGEMENT: REQUIREMENTS, TECHNOLOGY, AND THE DESIGN BASES OF NUCLEAR POWER PLANTS

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A Configuration Management (CM) design has been developed that enables a new facility to apply the discipline of CM from the beginning of the design phase and manage it effectively over the life of the plant. In contrast to the historical practice of constructing a CM system from the existing databases and information systems, this proposed CM system has been designed from foundational principles identified in critical design and licensing documents. The proposed design reflects an emergent taxonomy of design bases that identifies critical attributes and incorporates the relationships between the physical plant, the design and licensing requirements, and facility documentation. Additionally, and perhaps most importantly, the design incorporates a design bases rule set to identify which design related information is required to be maintained within the CM system.

The development of this CM design involved the review of regulatory documents issued by the USNRC, starting with the definition of design bases [1] [2]. Regulatory sources were considered foundational principles. Industry guidance documents [3] [4] [5] provided clarification and examples of foundational principles from the regulations.

The foundational documents related to CM were analyzed to define taxonomy, i.e., a rigorous method to classify CM information. The new taxonomy was designed to impose consistency, repeatability and accuracy on CM information. The concept of a Design Bases Rule Set was established that contains criteria for determining what plant information is included in the CM system.

The taxonomy was tested using actual plant configuration information. Design bases and regulatory requirements were used as references to construct and complete the taxonomy. The reviewers on the team validated the taxonomy and the actual data for consistency, repeatability and accuracy.

Minimizing the cost of plant configuration changes is an important but secondary concern for future nuclear plants. The need to capture the knowledge of an aging workforce systematically while managing the fleet of reactors with fewer staff creates additional concerns that increase the desirability of a comprehensive CM process. But overall, the primary reason for designing a new CM system is the issue of nuclear safety. The foundational approach to CM described here affords a substantially higher degree of confidence in the validity and consistency of the managed CM elements. Safety confidence is further increased because of the higher degree of certainty that safety margins are being maintained adequately.

The taxonomy is represented in Figure 1 by a hierarchy of requirements and implementing documents successfully achieved the objectives of consistency, repeatability and accuracy.

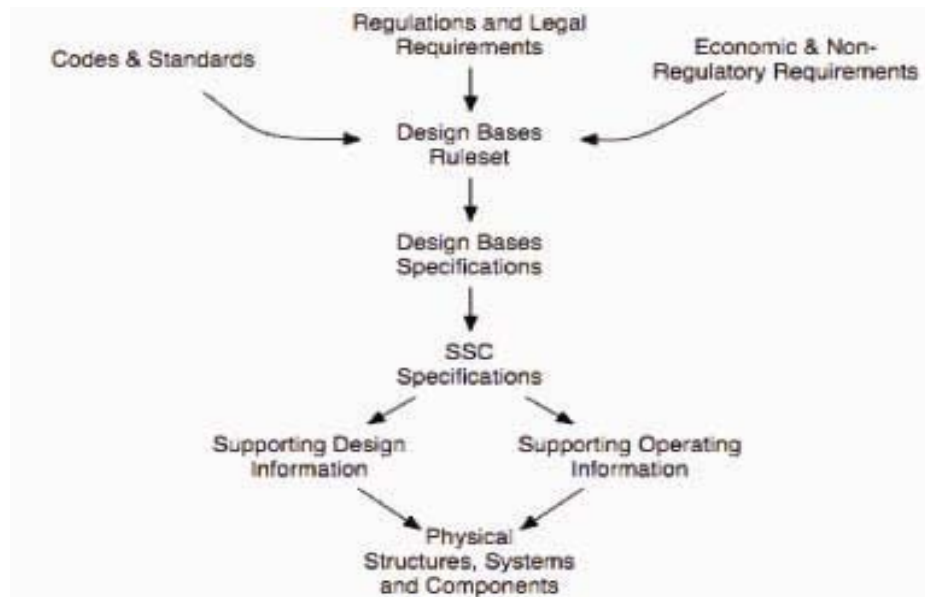


Fig. 1. Design Bases Taxonomy

This approach, intentionally hardware or software non-specific, will allow flexibility in documenting and maintaining the coherence of the physical configuration of the plant with the licensing and analytical bases, without regard to the mechanisms of execution. As coincident benefits, design bases margin management, calculation input and output management, and instrument set point management are all natural consequences of this taxonomy and are incorporated in the new CM design.

This new design for CM will enable a new facility to apply sound CM practices from the initial design phase and manage the relationships between the physical plant, the design and licensing requirements, and facility documentation effectively over the life of the plant.

REFERENCES

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