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PROGRAM FUNCTIONALITY AND INFORMATION ANALYSIS

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SUMMARY

PROGRAM FUNCTIONALITY AND INFORMATION ANALYSIS

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BACKGROUND

The Office of Civilian Radioactive Waste Management (OCRWM) is executing a plan for improvement of the United States Nuclear Waste Management Program. As part of the plan, OCRWM is performing a systems engineering analysis of both the physical system, i.e., the Nuclear Waste Management System (NWMS), and the programmatic functions that must be accomplished to bring the physical system into being. The functional analysis effort is being performed by two separate teams working in parallel, one of which addresses the physical system functions and the other the programmatic functions. This paper presents information on the analysis of the programmatic functions.

OBJECTIVE

The objective of the program analysis effort is to provide a sound basis for development of a comprehensive and integrated set of program policies, standard practices, and procedures necessary to execute the program effectively and efficiently.

SCOPE

The analysis addresses seven of the 16 programmatic functions derived from the OCRWM *Management Systems Improvement Strategy* (MSIS) . These seven functions are those that have the greatest importance to site characterization, system design development, and licensing. The functions are (1) Perform Systems Engineering, (2) Design Engineered Systems, (3) Identify and Characterize Sites, (4) Evaluate Integrated System , (5) Perform Confirmation/Operational Testing, (6) Ensure Regulatory Compliance, and (7) Provide Program Control. An eighth function, Provide Quality Assurance, was analyzed sufficiently to determine its interfaces and impacts on the other seven functions.

TECHNICAL APPROACH

These principal functions were decomposed in a hierarchical manner. The mission and scope of each function were defined and the functional interrelationships established. Process diagrams were developed that combined the functional process flows into a map of the integrated process. These functional process flow definitions show how the functions convert input products into desired output products. All externally imposed program requirements were identified and each requirement was allocated to its appropriate functions.

In performing the functional analysis, a set of principles was devised to define the characteristics that should be intrinsic to the program. These principles are that the program must

- **Be mission-driven.** Every function must contribute directly to the achievement of the program or system mission and be performed in accordance with the specified mission requirements.

- **Be completely defined.** The program must be defined at all times.

- **Be integrated.** The functional analysis must ensure the integration of the physical system elements, the technical development activities for the physical system, and the program processes for producing the system.

- **Be controlled at all times.** The definition and configuration of the programmatic processes that produce the physical system must be under change control at all times.

- **Incorporate performance assessment.** There must be a continual and systematic assessment of program performance with respect to specified requirements throughout the program life cycle.

SIGNIFICANT OBSERVATIONS

Several significant observations were made as the result of performing the functional analysis.

- **Information hierarchies** are developed as an inherent part of the functional analysis process can be combined in various ways to form the basis of programmatic documents such as the program management plan, system engineering management plan, quality assurance plan, program procedures manual, or other similar plans.

- **Products** are defined as program functions are decomposed and analyzed. This means that a product hierarchy is produced as an inherent part of the functional analysis process.

- **Control of system changes,** both program and physical, can be centralized and the concept of baseline change management can be applied.

- **Decision points** are identified throughout the functional analysis processes, including the information necessary for making those decisions.

- **Evaluation of risk** results from the program functional processes through the systematic identification, quantification, and application of risk management alternatives.

- **Technical performance measures** are identified and applied during the process of analyzing the system.

INTEGRATION LINKS

The analyzed functions form a coherent unit that characterizes sites, defines the engineered system, provides the information necessary for licensing, and controls the performance of these functions. Integration of the functions is shown in Figure 1. Three key integration links among the functions are noteworthy.

The first is the generation of requirements and program direction. This process is initiated in the Provide Program Control function where program mission and program commitments are used to develop an initial program strategy and set of requirements. These requirements and direction initiate the Provide Quality Assurance and Ensure Regulatory Compliance functions. Directions are integrated in the Provide Program Control function and delivered to the Perform Systems Engineering function where they form the basis for performance of the technical functions.

The second is that between the Perform Systems Engineering function and the other four functions necessary to define the system configuration. The Perform Systems Engineering function performs a mission analysis and requirements allocation that converts the mission and regulatory requirements to scientific/engineering requirements and allocates them to parts of the NWMS and to the other four Technical Control functions.

The third is among the functions that define the system configuration and the programmatic functions of Provide Program Control, Ensure Regulatory Compliance, and Provide Quality Assurance. The controlled technical information is available to all three of these functions. In the Provide Program Control function, the technical information is used to evaluate technical progress and determine the need for program redirection. It is also used to evaluate proposed changes and assess the response to approved change requests. In the Provide Quality Assurance function, the technical information is assessed to determine whether the quality assurance procedures for documentation, completeness of specification, and verification of results have been properly applied. In the Ensure Regulatory Compliance function, the technical information is assessed to determine its adequacy in meeting regulatory agency needs.

CONCLUSIONS

1. The functional analysis method is a valid and effective approach to identifying and defining the functions, functional interfaces, processes, and products that are necessary and sufficient to execute the program.

2. The interrelationships of the program functional processes are extremely complex. To avoid serious and costly errors, computer simulation should be used to model interrelationships.

3. The OCRWM program requirements imposed from external sources are extensive and complex. The most effective and efficient way to relate them to the appropriate function and control their disposition and changes is through a computerized relational database.

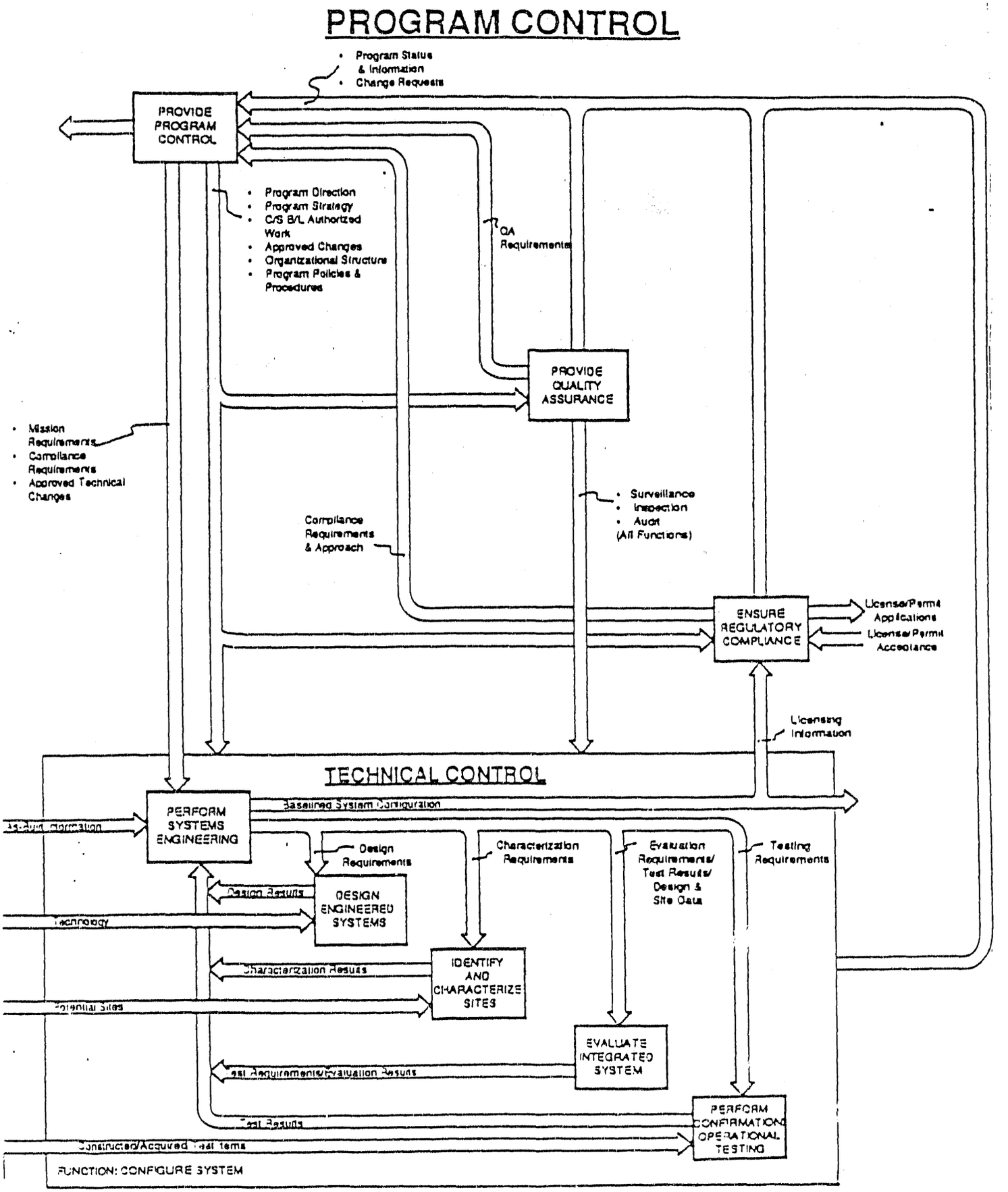

FIGURE 1. Principal Functional Processes

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