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Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
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THE TIGER TEAM PROCESS IN THE REBASELINING OF THE PLUTONIUM FINISHING PLANT (PFP)

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Abstract

The Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 called for the stabilization and packaging of a variety of plutonium and plutonium-bearing materials currently stored throughout the U.S. Department of Energy (DOE) Complex. One of primary concerns under this recommendation was the plutonium material at Hanford's Plutonium Finishing Plant (PFP). The PFP has experienced several operational and safety problems which impeded the development and execution of plans that would have satisfied the 94-1 recommendations. In addition, a complete shutdown of operations including the movement of fissile materials was instituted in December 1996. These problems, coupled with a tank explosion in the Plutonium Reclamation Facility, prevented restart of plant processes. Moreover, funding support became increasingly difficult to sustain on a facility that could do nothing more than basic surveillance and maintenance at an annual cost of approximately $70 million.

In November 1998, Fluor Daniel Hanford Company (FDH), after several calls for radical change by the DOE and the Defense Nuclear Facility Safety Board, formed a "Tiger Team" and used a teaming approach to update and challenge the existing technical and funding baseline for completing the PFP stabilization and deactivation activities. The mission of the team was to put into place a new baseline that was both aggressive yet supportable with expected funding levels while maintaining a high confidence of success. In developing this baseline, the team utilized a systems engineering approach to provide a clear path between requirements and proposed work scope. The team included individuals from DOE-Headquarters, U.S. Department of Energy, Richland Operations Office (RL), FDH, B&W Hanford Company, and support from other DOE complex experts. In addition, the Tiger Team was charged with the responsibility for updating the Recommendation 94-1 Implementation Plan commitments.

In April 1999, the team completed the first full facility baseline. Called the Integrated Project Management Plan or IPMP, this plan has been reviewed and validated as an acceptable baseline by DOE. It provides a sound, defensible, and achievable project baseline that will ensure success and fulfill key elements of the PFP project approach to meeting 94-1 commitments. The resulting new PFP IPMP identified a potential life cycle cost savings of about $1.17 billion and an overall schedule acceleration of 22 years. The baseline continues to be improved but has already provided a higher level of confidence to the DOE and the DNFSB that an aggressive approach is being taken to complete Recommendation 94-1 commitments.

This paper will describe the integrated, teaming approach and planning process utilized by the Tiger Team in the development of the IPMP. This paper will also serve to document the benefits derived from this implementation process.

Introduction/Background

The PFP is a Hazard Category II non-reactor nuclear facility that has been in use since the late 1940s. The complex contains chemical processing facilities, laboratories, storage vaults, support facilities, and offices to support plutonium storage and handling operations. The facilities were designed to provide shielded, ventilated, and specially equipped rooms with glove boxes to provide worker safety for plutonium processing. The initial mission of PFP was the conversion of plutonium nitrate to plutonium metal and metal fabrication. Follow-on missions for PFP included plutonium scrap recovery operations, reactor fuel manufacturing and defense material processing. Safe storage of plutonium-bearing materials and new missions necessitated the construction of a Vault Complex to provide floor, rack, and pedestal storage capabilities. In October 1996, DOE issued a shutdown order for PFP processing operations. However, pending deactivation and dismantlement, PFP continues to store significant quantities of plutonium-bearing material, spent nuclear fuel, and other nuclear materials in a safe and compliant manner until these materials are dispositioned.

In May 1994, the DNFSB issued Recommendation 94-1 to the Secretary of Energy. The recommendation identified a number of concerns regarding the storage of fissile materials and other radioactive substances across the DOE complex in buildings once used for processing and weapons manufacture. In response to Recommendation 94-1, DOE developed an Integrated Program Plan describing the actions that DOE planned to implement at its various sites to convert excess fissile materials to forms or conditions suitable for safe interim storage until final disposition. Each affected DOE site, including Hanford, developed a Site Integrated Stabilization Management Plan (SISMP) to detail individual site plans to implement DNFSB Recommendation 94-1. The DOE Implementation Plan and the SISMPs are periodically updated; the DOE Implementation Plan was last updated in December 1998 to reflect current processing approaches and schedules. The Hanford SISMP (BWHC 1997) provided detailed descriptions of the PFP material stabilization activities. As a result of the activities described in the Hanford SISMP, containerized plutonium-bearing materials will be stabilized and repackaged for safe and stable storage in accordance with DOE Standard 3013 (DOE 1996a).

The PFP Stabilization and Deactivation Project successfully restarted plutonium stabilization and packaging in January 1999 after an extended stand-down of operations imposed by BWHC to correct observed plant performance deficiencies. Although improvements have been made in many areas, for decades PFP has experienced similar, recurring technical, management, and programmatic challenges typical of plutonium processing plants and activities. These challenges have often presented themselves symptomatically in the form of problems that resulted in plant shutdowns and cessation of operations, pending formal reviews and corrective actions. During this period, PFP experienced several operational and safety problems which impeded the development and execution of plans that would have satisfied the Recommendation 94-1 requirements. These problems, coupled with a tank explosion in the Plutonium Reclamation Facility, prevented restart of plant processes, including the movement of fissile materials. Moreover, funding support during this period became increasingly difficult to sustain for a facility that had an annual surveillance and maintenance cost of approximately $70 million.

In November 1998, FDH, after several calls for radical change by the DOE and the DNFSB, decided to form a Baseline "Tiger Team" that would challenge the existing baseline and SISMP that had become obsolete. The mission of this team was to put into place a new baseline that was both aggressive yet supportable with expected funding levels while maintaining a high confidence of success. In developing this baseline, the team was to utilize a systems engineering approach to provide a clear path between requirements and proposed work scope.

Systems Engineering Approach

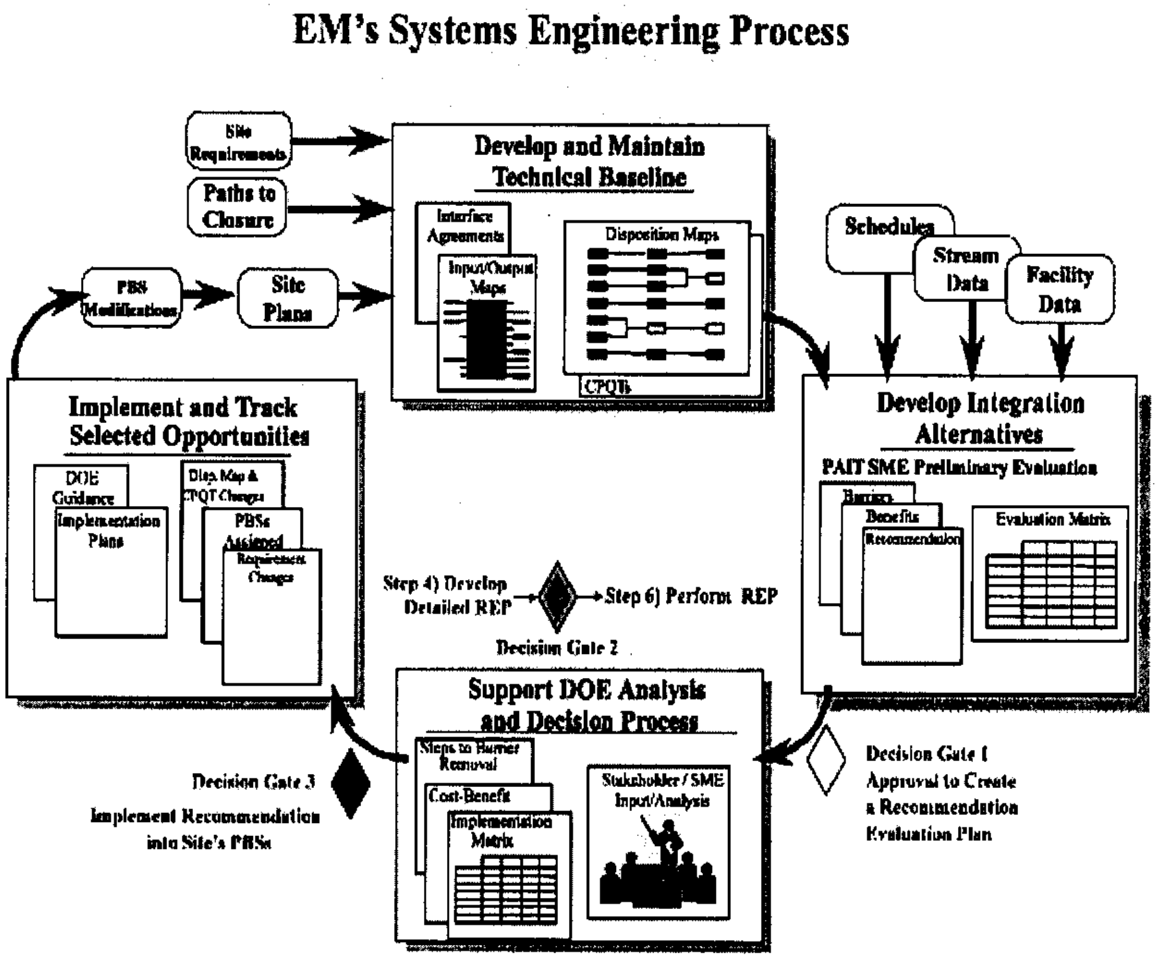

Figure 1. Diagram of Systems Engineering Process

Applying a standard systems engineering approach and integrating it with a project management model was a critical success factor. The benefits for following this approach were:

- Consistency of products and data levels across teams,
- Technical defensibility,
- Problem identification and mitigation,
- Requirements based defensible budget requests, and
- Understanding of the system as a whole.

Systems engineering is a structured process (reference Figure 1 above) adopted by DOE/EM for developing and improving systems, products, and services. It ensures that a problem is fully understood before a solution is created and implemented. Emphasizes is given to disciplined analysis of requirements and functions to ensure the solution satisfies the problem. Development and analysis of multiple alternatives avoids "point solutions" and ensures the best solution is used. The result is a system that delivers products and/or services that fully meet customer requirements.

The Tiger Team utilized a systems engineering approach to identify opportunities to combine, eliminate, and/or simplify activities, technologies, and facilities in support of the IPMP. The team performed the following functions:

- Defined driving requirements and baselines
- Identified integration opportunities
- Evaluated the impact of potential solutions on the system as a whole
- Implemented the opportunity through modifying baseline planning.

System baseline definition is a crucial step in describing the problem. This effort defines a snapshot of existing situations (technical, cost, and schedule) for the project. The project team had available a suite of proven tools to depict the baseline. These tools include disposition maps, input/output diagrams, quantity table information, and functional flow diagrams to depict program activities. Disposition maps represent the baseline functional breakdown for the site's waste or material streams. The disposition maps and input/output diagrams show interfaces and interdependencies among the DOE sites and waste types. The quantity tables contain the data used to dynamically generate disposition maps and input/output diagrams.

Systems engineering approach also facilitates facility studies to identify integration opportunities that are alternatives to the baseline to:

- Eliminate duplicate technologies,
- Improve schedules,
- Avoid capital expenditures,
- Consolidate waste streams, and
- Verify that implementation meets specified requirements.

Once integration opportunities are identified, the alternative analysis process begins to determine a proposed alternative based on defined criteria. Selected alternatives move into the implementation and verification steps of the systems engineering process. The decision gates included in the process (see chart) are intended to provide checks and approval prior to each increase in the level of effort needed to move opportunities to implementation.

Applying a systems engineering process yields several products:

- Mission definition, problem statement, system boundaries
- Requirements analysis documentation, including allocation to system functions

- Baseline definition, including functional analysis
- Alternatives development and analysis documentation (alternatives considered, trade studies conducted)
- Verification matrix
- Implementation planning.

Integrated Teaming (Tiger Team) Approach

The integrated approach initiated by FDH and BWHC was a highly focused effort using a dedicated team of specialists working collaboratively with PFP personnel and other subject matter experts. The approach applied the fundamental concepts of systems engineering in combination with the rigor of sound project management principles to develop a defensible and traceable, requirements-driven technical baseline. The Project Organization and the Quartet's interfaces are as depicted below:

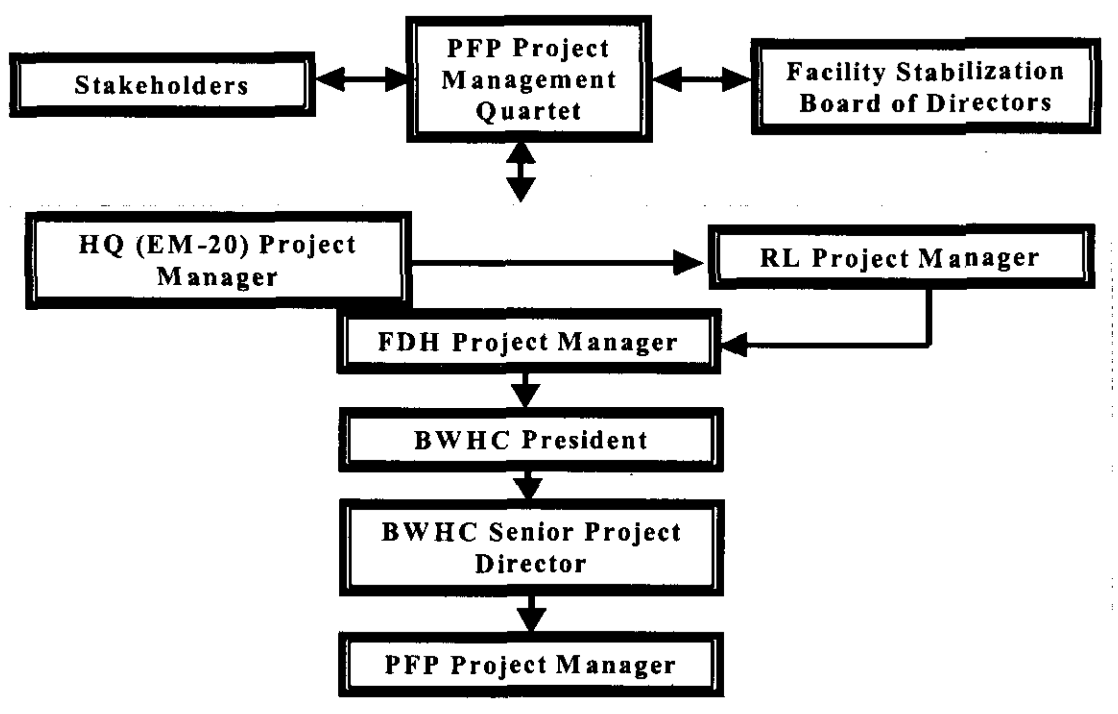

Figure 2. Project Management Inter-relationship

The reason for the rebaseline was to provide:

- High confidence project input into the Recommendation 94-1 Implementation Plan;
- Technical, schedule, and cost bases with which to propose changes to the fiscal year (FY) 1999 MYWP baseline; and
- Input into future Program Baseline Summaries.

The overall objective was to finalize the preparation of the PFP IPMP and its associated plutonium stabilization integrated schedules in a time frame which enables the project to provide sound, defensible, and achievable updates to the DNFSB Recommendation 94-1 Implementation Plan. In doing so, the team was to use a teaming approach with other stakeholders to ensure communication and coordination at all levels. In addition to the BWHC Project Management Team, the Tiger Team also interfaced with a Project Management "Quartet" consisting of representatives from each of the four principal organizations having responsibility for the PFP Project. The PFP Project Management Quartet included representatives from BWHC, FDH, RL, and DOE-HQ. The Project Organization and the Quartet's interfaces are as depicted below:

Two sub-teams were formed (called Team A and Team B). The roles and activities of these two sub-teams were to perform the following:

Team A

- Accelerate IPMP development
- Add planning expertise
- Increase management attention
- Develop a more complete baseline (IPMP)

Team B

- Review issues in existing documentation
- Challenge current assumptions
- Hold an issues resolution workshop
- Identify opportunities to accelerate work
- Improve 94-1 Implementation Plan
- Identify enabling assumptions

An overview of the integrated approach implemented by the PFP "Tiger Team" is provided in Figures 3, 4, and 5. Figure 3 provides the integrated schedule developed by the Tiger Team. Figure 4 provides the Team B actions for improving the DNFSB Recommendation 94-1 Implementation Plan. Figure 5 is essentially the products of the systems engineering process embedded into the appropriate project planning process steps. Embedding the systems engineering products into the overall project planning process effectively married the two processes and focused the systems engineering portion on the development and understanding of the "scope" portion of a project.

Once the systems engineering/project-planning approach was clearly defined, it was necessary to apply this integrated system in a way that would result in a high confidence project baseline for the PFP. The four key elements that were used to successfully implement the integrated approach and define a defensible project baseline were as follows:

- Planning Guides
- Standardized Reference Estimates
- Focused Planning Workshops
- Data Management and Control

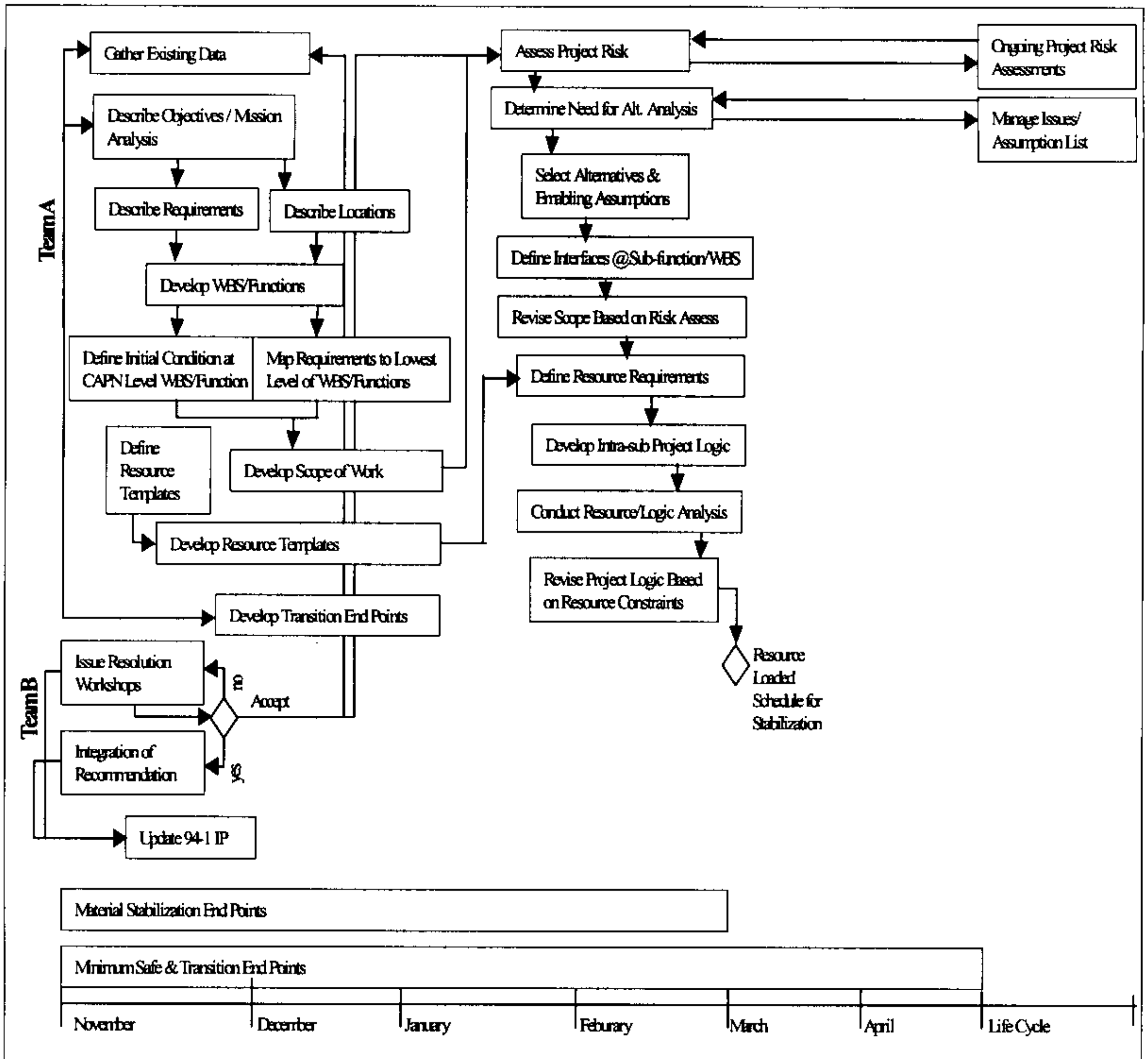

Figure 3. PFP "Tiger Team" Integrated Schedule

Planning Guides

A series of project planning guides were developed in an effort to provide a consistent and documented approach for project baseline development. This was especially important since the three primary PFP project functions were being planned simultaneously by separate planning teams (under the coordination of a single project planning lead). Additionally, the approved planning guides provided a "contract" between the "Tiger Team" and the project management team regarding the content and structure of the baseline planning elements.

Standardized Reference Estimates

Many enabling documents (e.g., procedures, work plans, etc.) and management activities (e.g., training, oversight, etc.) are common to each of the project mission functions. Therefore, in order to facilitate the development of the project estimate and ensure consistency across the project functions, standardized reference estimates were developed and applied to common/repetitive activities.

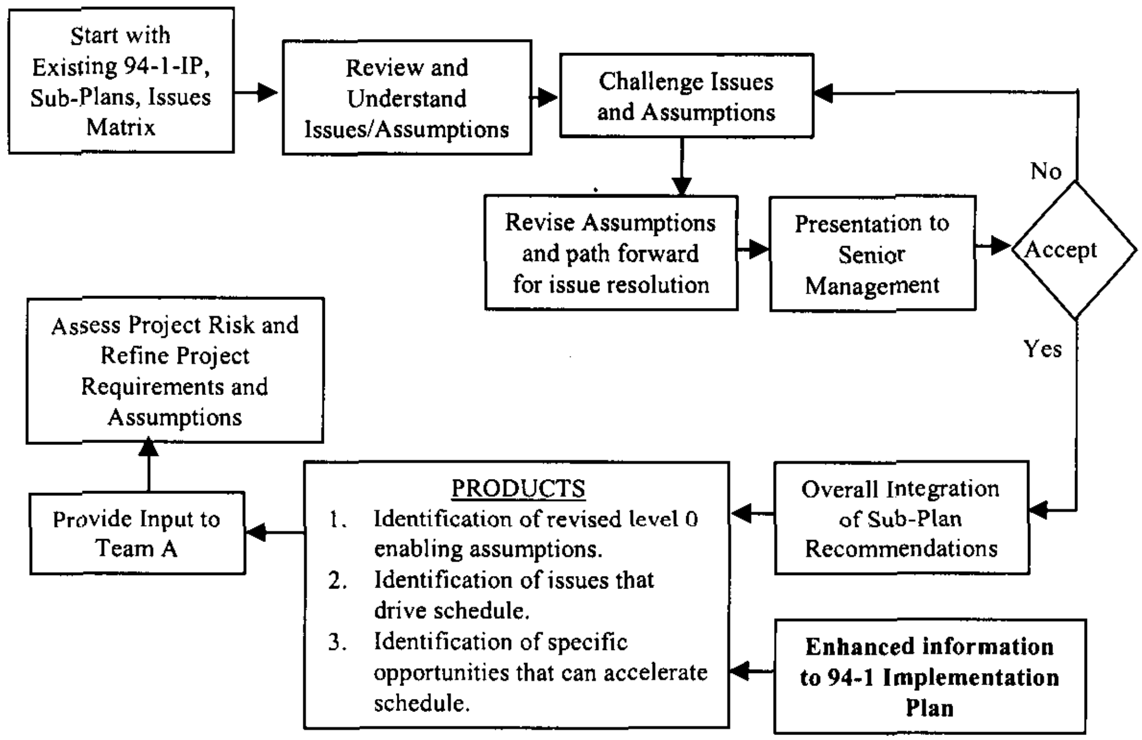

Figure 4. Team B (Improve 94-1 IP)

Focused Planning Workshops

Focused workshops were used as the starting point for the development of the detailed activity-based cost (ABC) estimates and associated schedules. The focused workshop approach was based on commercial project planning models where competitive forces drive the project team to quickly, effectively, and accurately prepare project plans. The focused workshop approach allowed the "Tiger Team" to leverage the available hours of PFP management and technical experts so that their time away from the facility priorities/activities was minimized

Data Management and Control

The development of a project baseline requires a significant expenditure of resources and typically results in the generation of a high volume of information and data (studies, requirements, product and waste inputs/outputs, issues and assumptions, interfaces, etc.). For more complex projects, the data is too voluminous and if not properly captured, maintained, and managed, this critical project information can be lost or difficult to find and link to the appropriate project elements. The Technical Baseline Management System (TBMS) was developed to collect and manage the information that comprises the project baseline. The TBMS relies on a link to the appropriate Work Breakdown Structure (WBS) element to archive and retrieve critical information. This link allows the project manager to generate reports by data type (e.g., requirements) for a specific WBS element. The reports can then be used to evaluate quickly and effectively the impact of proposed changes on the project baseline and provides for high confidence "corporate memory" as the project evolves.

Products of Integrated Teaming (Tiger Team) Approach

The development of the new PFP project baseline using the integrated systems engineering/project management approach resulted in a strong and manageable tie between the technical aspects of the project and the cost and schedule. The key components of the new baseline are:

- WBS Directory = Function
- Requirements
- Issues Management
- Integrated Management
- Materials
- Gap Analysis for Functions/Requirement
- Alternatives Tracking List
- Project
- Final Condition
- Location Description for Areas
- Identification of Interfaces
- Basis of Estimate

The following are examples of products developed by Team B and utilized by the project.

- Enabling Assumptions:
  Ship or treat polycubes
  Number of furnaces available
  Hydrided metals can be stabilized with existing plant equipment

- Issues that drive the schedule:
  Stalled negotiations with LANL
  Uncertainty in equipment reliability and throughput
  Complex-wide disagreement over risks associated with nitrides

- Specific opportunities to accelerate schedule:
  Offsite material shipment discussions with LANL
  Addition of parallel stabilization crews and processes
  Risk management decisions regarding stabilization of metals

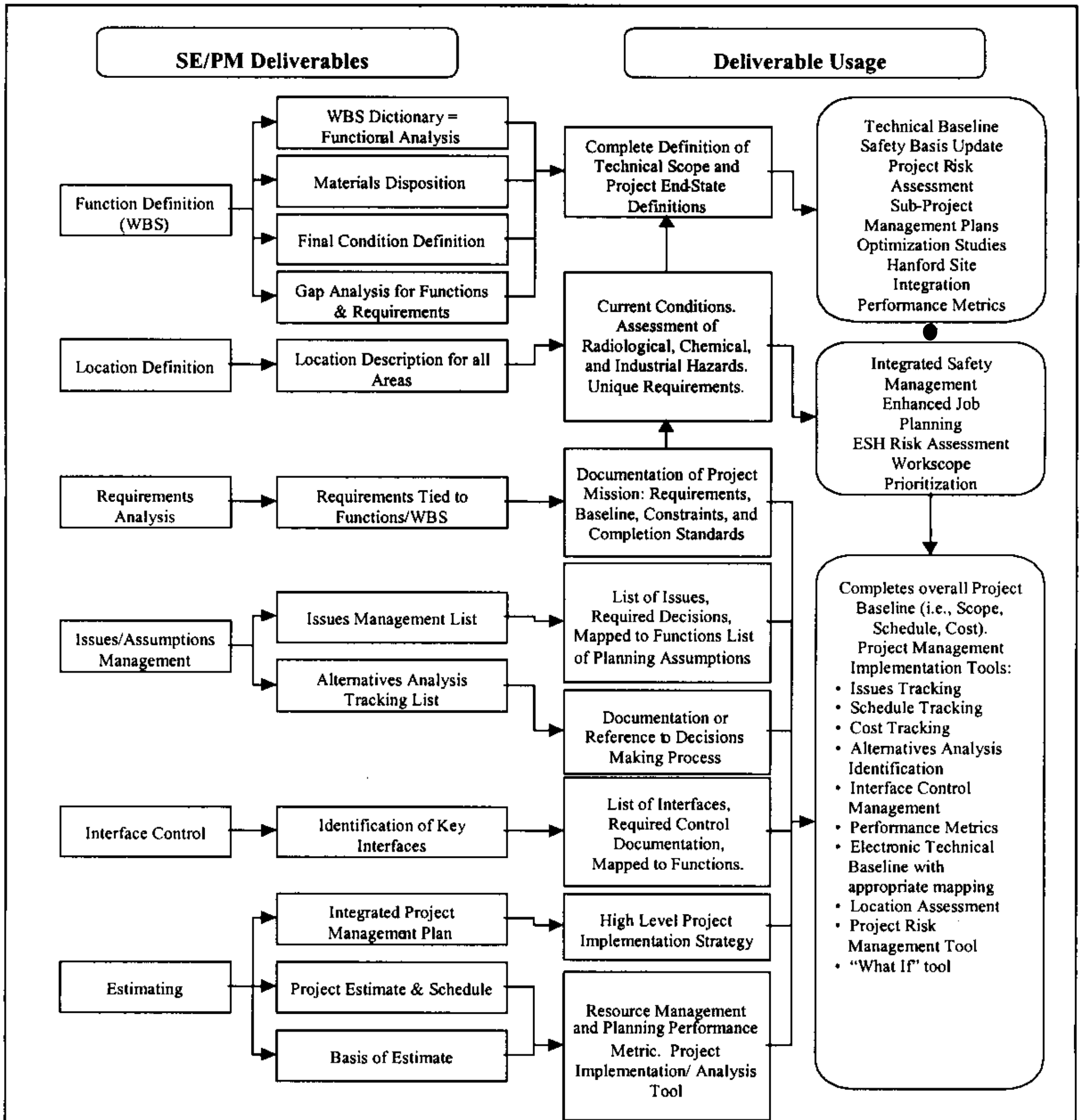

Table 5. System Engineering Process

Communication Process

Communication and coordination among all interested parties was key to the successful development of the IPMP. The "team" involved in this communications effort consisted of management and program personnel from DOE-HQ and RL, and FDH/BWHC top management, project managers, planners and schedulers with responsibilities or direct interest in the safe completion of the PFP stabilization and deactivation activities. This coordination began early and continued throughout the process, to ensure common understanding and common goals from all parties. The diagram below depicts the communication process established, parties involved and the frequency of the process.

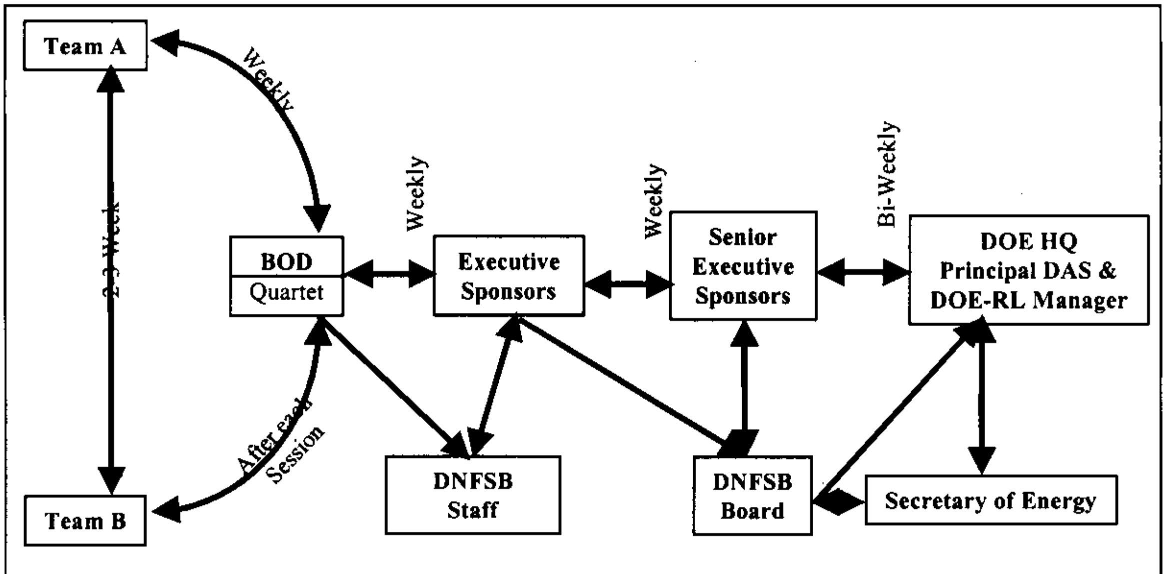

Figure 6. Communication

Benefits of Tiger Team Approach

Benefits derived from using from using the Tiger Team approach included:

- Allowed team and management to be more responsive to schedule expectations and emerging issues;
- Allowed the identification of improved technologies and integration opportunities;
- More effectively aligned senior management with planners;
- Allowed commitments to be made in parallel with baseline development; and
- Enhanced current plant talent with outside resources.

Conclusion

The PFP IPMP was prepared using a focused "Tiger Team" approach that allowed facility personnel to participate in the planning without full time dedication, thereby allowing the facility to complete multiple high priority activities in parallel. The "Tiger Team" was comprised of about 20 full time personnel over a 6-month period at a cost of about $2.5 million. The resulting new PFP IPMP identified a potential life cycle cost savings of about $1.17 billion and an overall schedule acceleration of 22 years. The plan incorporates aggressive schedules and identifies numerous integration opportunities and improved technologies to achieve the ultimate goal of PFP stabilization and deactivation.

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