

TECHNICAL BASELINE MANAGEMENT SYSTEM- A LIFE CYCLE PROJECT PLANNING AND TRACKING SYSTEM

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ABSTRACT

In recent years, the focus of the U.S. Department of Energy (DOE) complex has shifted from production to facility stabilization, deactivation, decommissioning, and environmental restoration. The decision to transition a facility from an operating mode through stabilization, deactivation and decommissioning typically requires development of a new project baseline plan to establish the project life cycle cost and schedule. This paper describes an integrated systems engineering/project management planning tool that has been used successfully in the past (the Hanford Plutonium Finishing Plant [PFP], Hanford 300 Area), and is also currently being used (Mound Facilities), to plan the transition of DOE facilities in a way that is consistent with the requirements provided in DOE Order 430.1A, Life Cycle Asset Management (LCAM).

The DOE has developed four guides to provide implementation guidance for requirements found in DOE Order 430.1A, specific to the transition and disposition of these contaminated, excess facilities. The LCAM Order requires that a systematic method for detailed engineering planning and documentation be used to execute the preferred deactivation alternative. As such, a systems engineering approach has been recommended for use throughout this process to ensure the essential elements of the deactivation process are integrated at all appropriate levels. DOE Guide 430.1-3, Deactivation Implementation Guide, provides the recommended content and purpose of deactivation project management plans and documentation.

In order to facilitate the development and revision of project baselines and minimize the impact on facility resources, a data base management system, Technical Baseline Management System (TBMS) was developed and used at Hanford to manage the linkage between the project technical elements and the functional elements of the Work Breakdown Structure (WBS). The methods, tools and products derived from the Hanford facilities' efforts provided useful lessons learned and templates for the Mound Site and other DOE facilities planning transition and D&D projects.

This paper explains the life cycle project planning and tracking system, TBMS, which has been previously used at Hanford and is currently being utilized by the Mound site to manage the linkage between the technical elements and the functional elements of the Work Breakdown Structure (WBS). Although papers have been presented in the past on similar projects at Hanford, the intent of this paper is to show how this management system, and its planning tools, have evolved and how the system can be used at other DOE facilities planning transition and D&D projects.

INTRODUCTION

Facilities undergoing deactivation transition planning require Technical/Cost and Schedule baselines to be developed and maintained to meet customer expectations on scope analysis, schedule certainty, and quality of estimate. Issues specific to major deactivation transition planning project missions and baseline maintenance include (see Figure 1):

Maintaining Safe and Compliant Conditions, specifically:

- Confidence in project estimate, and
- Requirements basis

Stabilizing/Disposition of Nuclear Materials, specifically:

- Confidence in project schedule,
- Delay in DOE Complex commitments to the DNSFB, and
- Interface/Approach inconsistencies throughout the complex

Transition Planning, specifically:

- Confidence in project scope/schedule/estimate, and
- Impending State CERCLA/RCRA negotiations/agreements

Other Factors:

- Facility/Stakeholder expectations for re-baseline quality versus compressed schedule and competing priorities, and
- Contract Performance Agreements to establish the Life Cycle cost/schedule baseline.

Technical Baseline Data often needs to be developed from a clean slate. This is usually done when the facility is in a shut down mode or is just completing final operations. The Facility deactivation planning Work Breakdown Structure (WBS) is normally developed functionally, based on system end points and other requirement drivers. Often, a focused "Planning Team" approach is used to develop initial baselines. 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 relatively small projects, the skilled project manager is able to manage these in subproject plans and project estimates/schedules. For more complex projects, the data is too voluminous and if not properly captured, integrated, maintained, and managed, this critical project information can be lost or difficult to find and link to the appropriate project elements. It was for this intended purpose that TBMS was developed, to integrate technical, cost, and schedule baseline information. In doing so it allows the project manager easy development and management of program plans, and provides a retrievable and traceable means for managing programmatic baseline data.

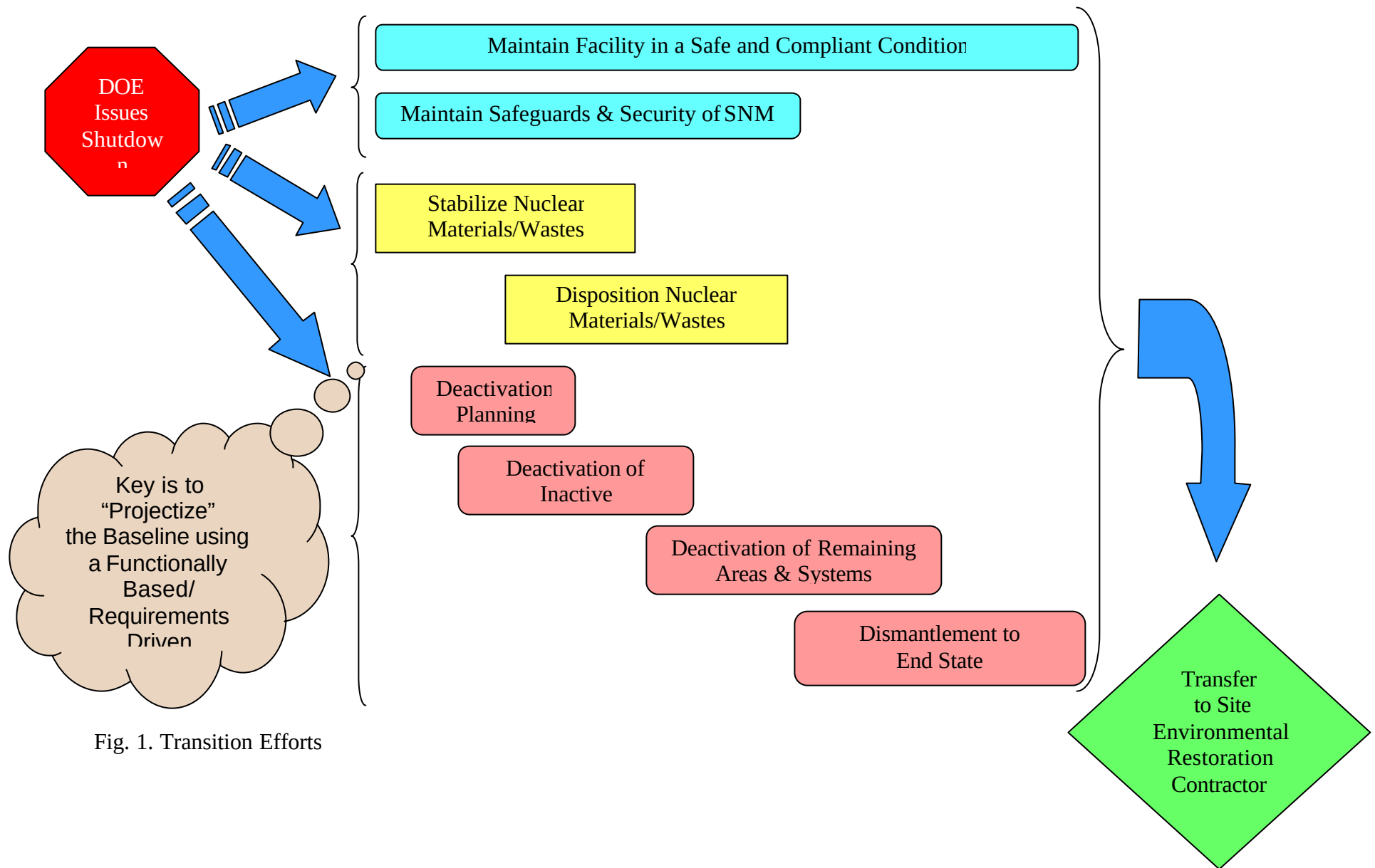


Fig. 1. Transition Efforts

The TBMS is a life cycle project planning and tracking system (Figure 2) that provides the deactivation activity project manager with a tool to assimilate and monitor project implementation criteria. The system is built around the project's functional analysis as defined by the work breakdown structure (WBS). The WBS is mapped to all baseline elements (technical scope descriptions, requirements, work location descriptions, hazards identification, risks, interfaces, technical scope, issues/assumptions, input/output quantities, project resource estimates and duration, etc.). The TBMS provides project managers the ability to quickly identify and assess impacts of changes to any change in a project technical element. The system also provides the project manager with tracking capabilities for technical issues, enabling assumptions, alternatives analysis, decision points, waste forecasts, and interface control documentation.

PROJECT DATA MANAGEMENT AND CONTROL

The TBMS was developed to collect and manage the key information that comprises the project baseline. The TBMS relies on a link to the appropriate 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. It is also used to compile and generate the "Basis of Estimate" documents that support the project cost estimate and schedule. Figure 3 depicts the information provided in a typical "Basis of Estimate" document which is maintained by the TBMS. Figure 4 provides an outline of the TBMS structure and data element relationships.

System Structure

The TBMS is driven by Microsoft[®] Access software with window driven input and display screens. The screens and available data are dependent on the level in the WBS requested. The system can be input directly from the input screen or data can be transferred in via Access or Excel spreadsheets. The system was developed in this manner to allow for multiple users to provide input on standalone spreadsheets (i.e., waste forecast, requirements, location assessments) where going through multiple WBS items was not efficient.

Once these import files are prepared, a mapping exercise to the specific WBS is required prior to importing into the TBMS.

Security is provided through a data administrator and again is tied to the WBS. Change control is managed by the database administrator through authorizing change control numbers into TBMS that changes can be recorded against. Once a change control action is ready for management approval, a change control package can be generated out of TBMS to include all of the affected project elements.

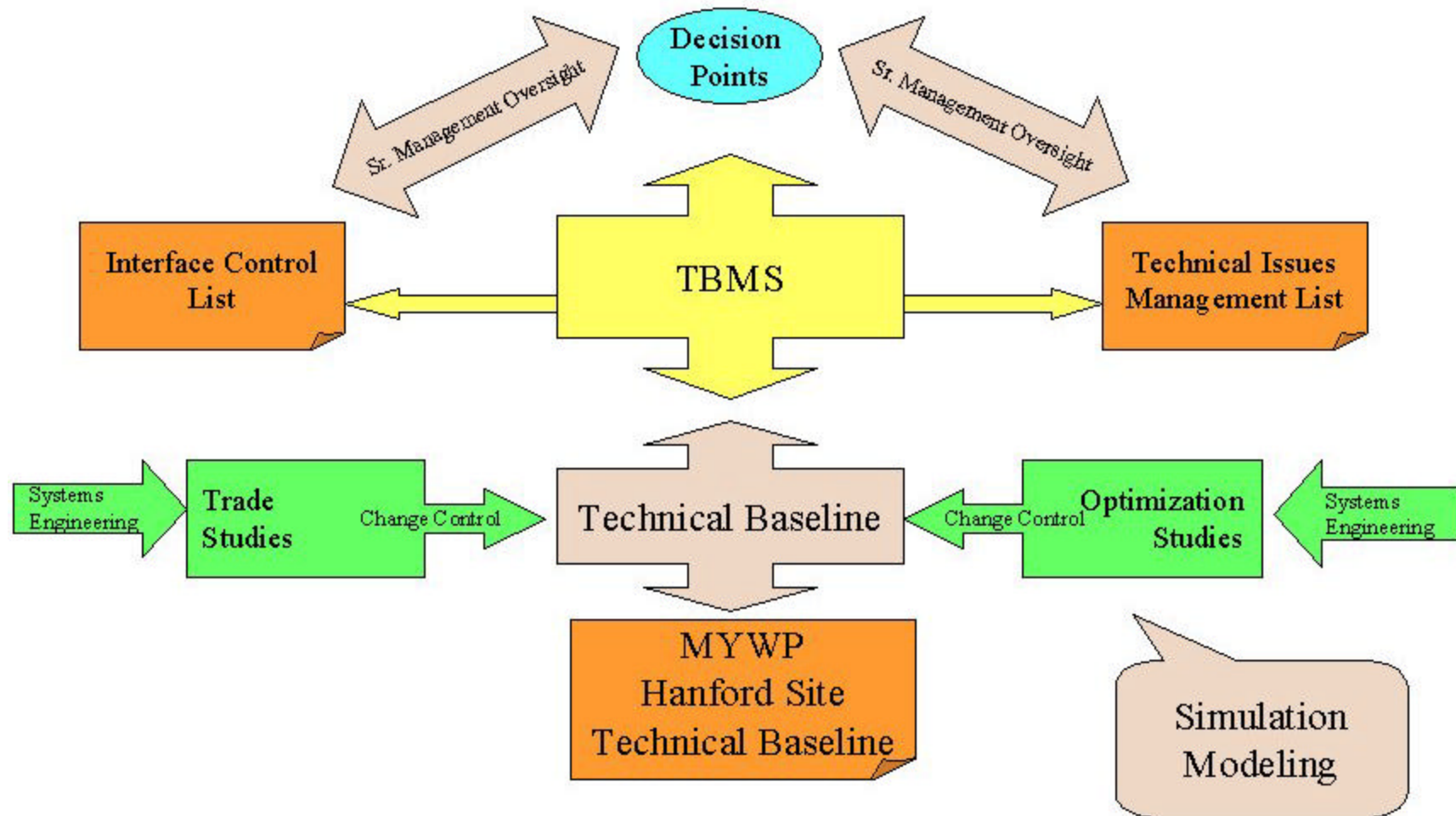


Fig. 2. Technical Baseline Management

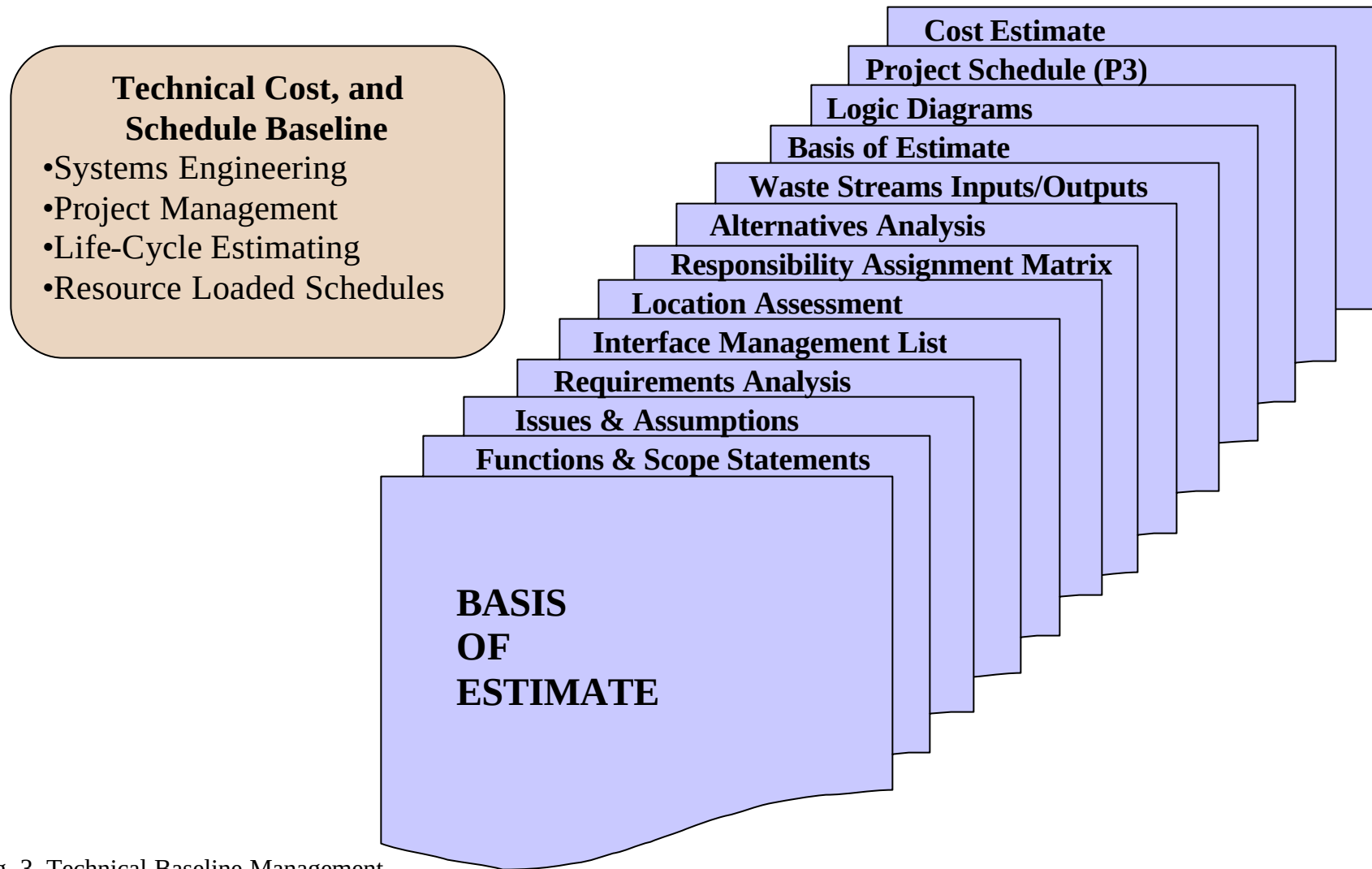


Fig. 3. Technical Baseline Management

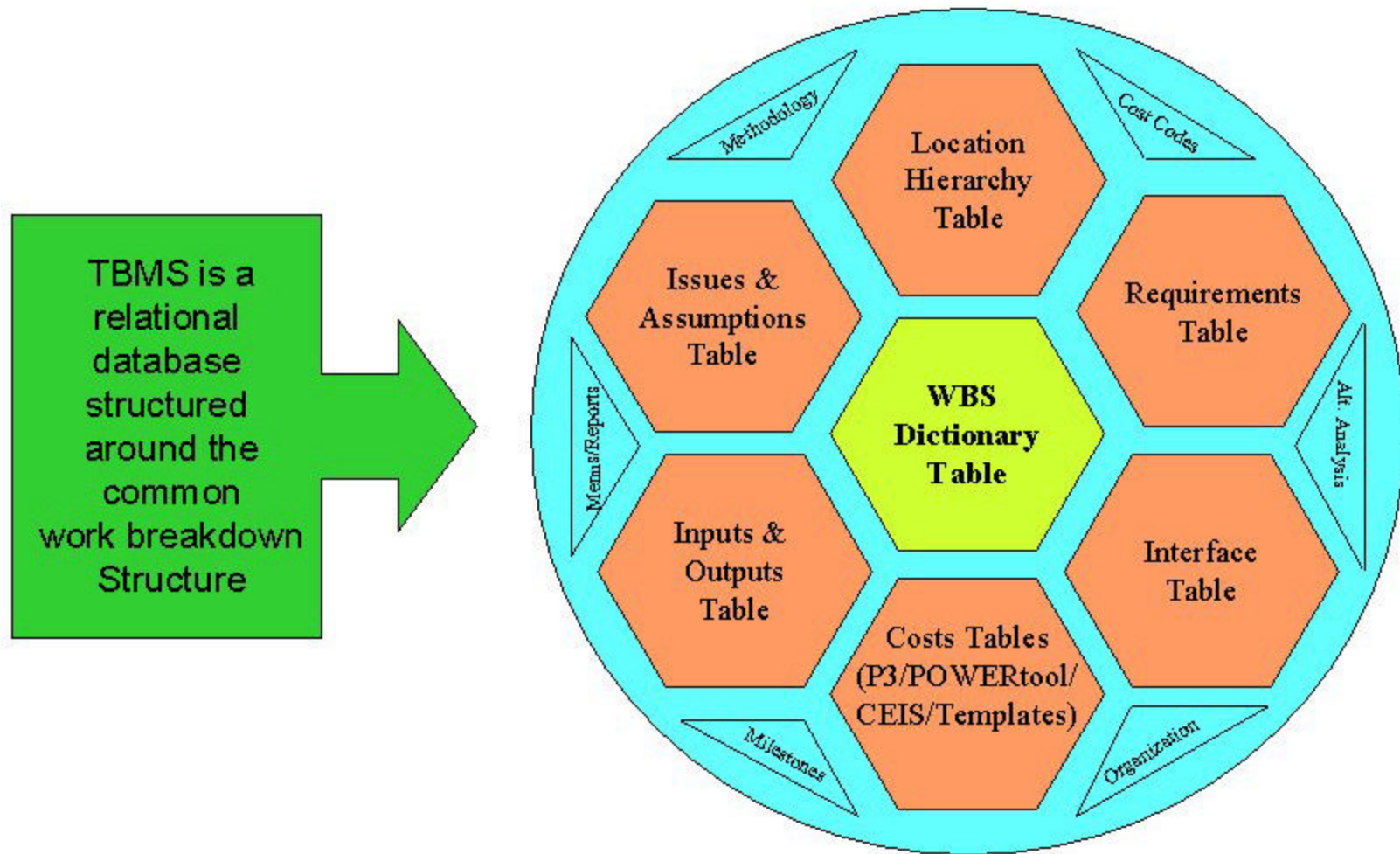


Fig. 4. TBMS Data Relationship

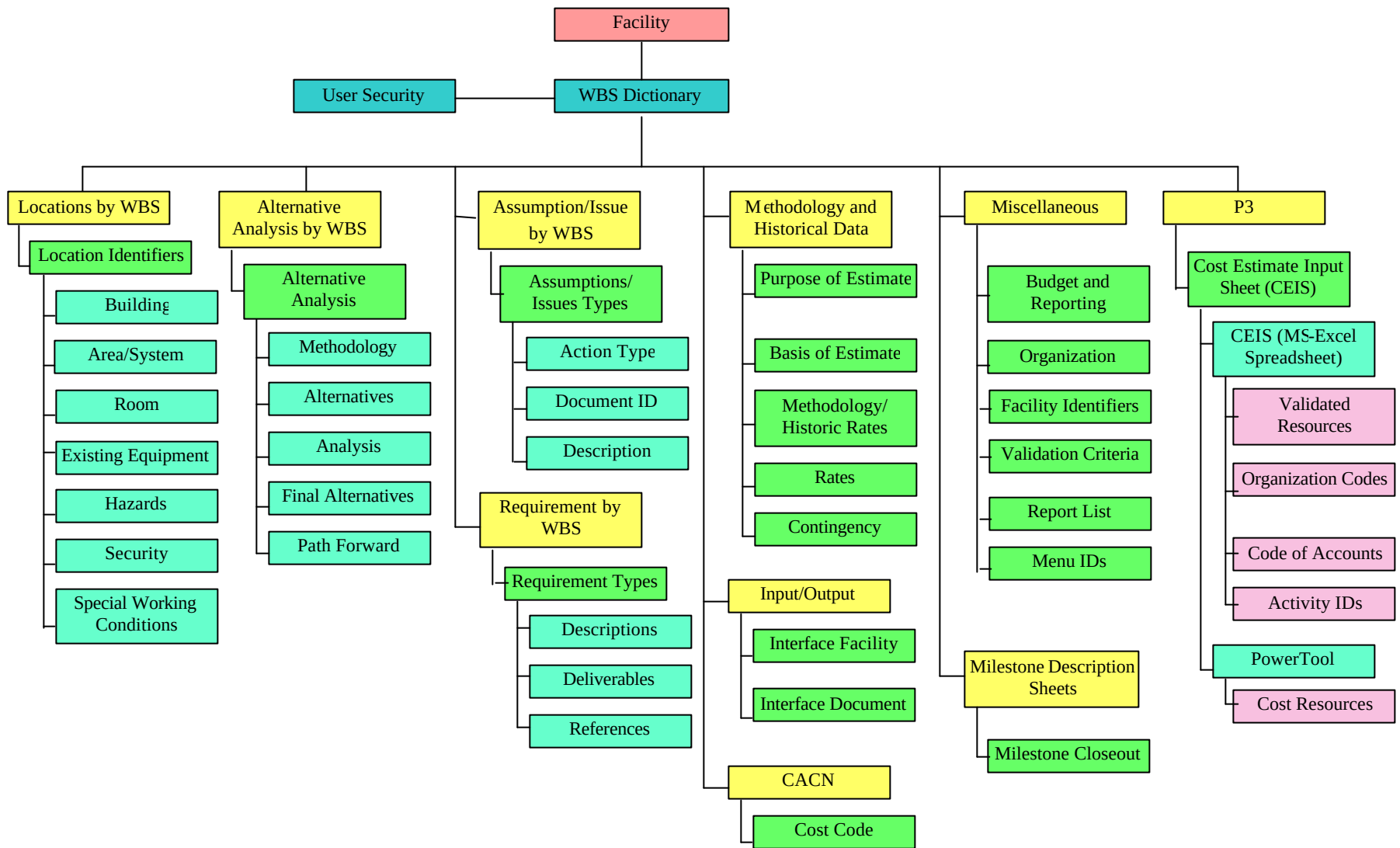


Fig. 5. TBMS Data Relationship

TBMS Modules

As stated earlier, the TBMS is developed and integrated around the projects functional analysis or WBS. The TBMS contains data tables/input screens or “modules” for the following project elements (Figure 4 & 5): Requirements, Issues/Assumptions, Locations, Interfaces, Inputs/Outputs, Milestones, and Resources.

- Requirements. Contains requirement reference, brief description, requirement deliverable (expectation or outcome), and type (for sorting purposes)
- Issues/Assumptions. Contains Issue or Assumption description, type, impact, closeout requirements, closeout due dates, enabling assumption used in the baseline, champion, sponsor, and schedule requirements.
- Locations. Contains data for the buildings, areas, systems, rooms, and components. Data includes as-is condition, radiological, chemical, and industrial hazards, and special working conditions.
- Interfaces. Contains internal and external interfaces between project functions (WBS). This lists interface description, receiving and supporting function, the interface control document, required documentation, document author, and schedule requirements.
- Inputs/Outputs. Records system inputs and outputs related to material and waste processing. Other inputs/outputs could be tracked if desired (i.e., support materials and utilities). Details include input/output source and receiver, quantity type (i.e., cubic feet or meters, cans or items), packaging type, schedule data, and spreads over early start/early finish.
- Milestones. Provides a milestone description sheet and historical closeout notes page.
- Resources. Contains a Cost Estimating Input Sheet with planning assumptions, estimate stage, resource requirements, and notes page to record calculations.

User Interface

The TBMS was developed to be on a local area network server with both read-only and read-write capabilities. The user primarily needs to know Windows “point and click” applications, although knowledge of Excel and/or Word is helpful. The system contains user help options.

System Interface

TBMS has the capability to send export files to various site level systems including the site managed technical baseline system, and the site standard scheduling estimating system (currently Primavera P3).

TBMS FEATURES AND BENEFITS

As stated earlier, TBMS provides project managers the ability to quickly identify and assess impacts of changes to any change in a project technical element. The system also provides the project manager with tracking capabilities for technical issues, enabling assumptions, alternatives analysis, decision points, waste forecasts, and interface control documentation. Additional features and benefits of TBMS are:

TBMS is used as a repository and report writer for “Basis Of Estimate” documents (Project Management Plan basis):

- Basis of estimates can be customized for printing at any level of the WBS for the particular project needs, and

- Has the rigor and trace ability needed to withstand Independent Cost Estimating (ICE) team reviews

TBMS provides the ability to generate other useful reports:

- Waste Forecasts
- Issues Management (risk reduction/avoidance)
- Interface Management
- Endpoint Close-out (requirements management)
- Location Analysis
- Subproject Management Plans

TBMS provides other management tools:

- Provides a tool for doing “what if” exercises.
- Provides online/real time access of data for regulatory documents/reports.
- Provides a management tool for managing risks and future baseline change requests.

TBMS FIELD EXPERIENCE AND LESSONS LEARNED

TBMS is currently being used on a number of transition project (program) applications

- Hanford 300 Area, Accelerated Closure Project Plan & Hanford 324/327, Rev. 3 Project Management Plan development
 - Integrates Data from Multiple Site Contractors
 - Produces custom “slice” reports
 - Basis for Performance
 - Supports Waste Forecasting & Issues Management
- Hanford PFP, Rev. 3 Integrated Project Management Plan (IPMP) Update
 - Basis of Estimate (BOE) update
- Mound Advanced Technology Site, Mound Exit Project Plan (See Lessons Learned)
 - Basis of Estimate (BOE) update
 - Integrates data from multiple site groups
 - Supports issue and risk management activities
 - Supports sub-project management plans

TBMS is also being used to support project & subproject level execution.

- Project Plans/Engineering Analysis/Change processes at Hanford and Mound

LESSONS LEARNED

The use of Technical Baseline Management System at Mound

Early in Fiscal 2000, the Mound Site began a revision to the site baseline. This was required to implement a new technical approach associated with its critical path project, "Main Hill Tritium". In addition, changes to operable unit cleanup strategies and other changed conditions within non-critical path projects needed to be incorporated into the baseline.

The work breakdown structure (WBS) and schedule network required significant updating to reflect the incorporation of technical approach and changed conditions. During the development of this new structure enabling assumptions and potential issues were encountered in order to continue development of the network without the benefit of completed alternatives analysis and/or definitive design.

In order to complete such a revision to the baseline the tools to be employed to develop the baseline were reviewed. The Mound Site used Timberline as a scheduling tool, Primavera as the scheduling tool, and COBRA as a performance measurement tool. It was determined that the scheduling, estimating, and performance measurement tools were more than adequate to complete the revision and manage the resultant baseline. What was missing was an integrated tool to manage the technical baseline.

The Technical Baseline Management System (TBMS) was evaluated and was selected as the tool to assist in managing the technical baseline. The WBS was cross-walked to the activity identification numbers (ActID) in the Primavera Schedule. For Main Hill Tritium an eighth level of WBS was developed to correspond with the assembly detail in the Timberline estimate (level 7 matched the ActID on the schedule). Scope of work descriptions were then assembled for each level of the WBS.

While assembling these scope descriptions, the WBS level was also evaluated for enabling assumptions, technical or regulatory issues, interfaces and basic assumptions. This evaluation was documented in the Issues/Assumptions module of TBMS for evaluation, use in the Project Risk Assessment, and future issue/assumption resolution and management.

In addition WBS elements that generated waste were analyzed for waste characterization, volumes, projected containerization strategy, and final destination. This data has been loaded into the input/output module of TBMS and was used to be the basis for the waste forecast.

Although TBMS has other modules associated with location specific analysis, the milestone module, and requirements basis. These modules have yet to be used at mound. The location and milestone module will probably not be used since others systems exist on site that meet those needs.

In the future Mound will continue to use TBMS to manage the technical baseline including baseline change control for technical issues, issues/assumption and risk management, and waste forecasting. If funding allows, we would also like to complete the requirements analysis module and network TBMS to the rest of the Mound Site. It has been a valuable tool during the last year saving many

computer input labor hours due to its relational database features, and in assembling issues, assumption, scope, and waste baseline data that may have slipped through the cracks during the baseline development process.

The use of Technical Baseline Management System at the Plutonium Finishing Plant

The TBMS system was evaluated and selected at PFP to assist in the development of the basis of estimates (BOE) reports for the PFP annual Project Management Plan. These reports are based on Work Breakdown Schedule (WBS) provided on the site wide Primavera baseline system and its change control process. Scope of work definitions are assembled at each level of the WBS and the BOE reports them at the eighth level. At this time there is no direct data link between Primavera and TBMS. PFP is looking to partner with the 300 Area in its effort to enhance TBMS and make it an integrated system between Primavera, the site schedulers, and the site planners.

TBMS Field Experience and Lessons Learned at the 324/327 buildings at Hanford

TBMS is being employed in deactivation and transition projects. The software is compliant with networking protocol and is accessible to multiple users and locations simultaneously.

Richland Operations, Hanford Washington: 324/327 Buildings Stabilization / Deactivation Project, Project Management Plan (PMP).

This project represents the “birthplace” of the concept of capturing a complete basis of estimate (BOE) in an electronic database that became known as TBMS. Since inception in FY 1998, the TBMS has been improved and upgraded with respect to the depth of interrelationships between the work breakdown structure and the basis of estimate information components, cost resource tables, and reporting functions. The 324/327 PMP has been through three revisions, utilizing TBMS for the 2nd and 3rd revisions. Only a limited number of hardcopy volume sets were delivered for Rev. 3, with the contractor and customer (DOE-RL) instead relying on the electronic database of information for validation and acceptance. The use of TBMS greatly eased the task of validation and the gaining of acceptance of the estimate by the customer. Having now entered the maintenance mode, an annual upgrade to the PMP will occur in FY 2001 through the use of TBMS.

DESKTOP ROLLOUT: 324/327 PMP – FY 2000

TBMS was made available on a limited number of desktops (15 personnel) through use of the HANFORD Intranet in FY 2000, where it has been used by both Project Managers and Baseline Control / Project Control personnel. The most common use for TBMS has been to access and make reference to the technical description of work to be performed, located in the BOE's, and other informational tables including Issues Management, Waste Forecasts and Customer Requirements. Project Planning and Integration staff were able to complete a risk analysis evaluation of the 324/327 Project with minimal participation / disruption of the facility through use of the information contained in TBMS.

UPDATE CAPABILITY AND CONFIGURATION CONTROL

Finalization of the TBMS planning module, which will allow for online revision and configuration control of baseline changes in nearing completion and is scheduled for implementation in March 2001. This module will allow the users to generate, review, approve and electronically update the data tables concurrent with baseline changes. This will greatly ease TBMS's information maintenance requirements and save the man-hours previously required when periodically upgrading and validating a basis of estimate during fiscal year work planning and out-year budgetary cycles. Built into this updating / configuration control feature is the assignment of different user classes to include read only, read and write in selected databases, and overall "master" editor with administrative update capability, designated and controlled by user access. Therefore, effective control of the data contained within TBMS can be achieved using the power of both software-access control and administrative procedure.

SITE INTRANET COMPATABILITY

TBMS will be available for download and access by any user at the Hanford site in April 2001. Included in this upgrade are the databases for the 324/327 PMP, the Plutonium Finishing Plant (PFP) Integrated Project Management Plan (IPMP), and the 300 Area Accelerated Closure Plan (300 ACP). Managed by the Site's Information Resource Management (IRM) contractor (Lockheed Martin Services, Inc.- LMSI), TBMS will complete final software testing and conform to all production software procedures and protocol. The completion of this phase will serve to bolster the confidence that potential users of this system may have as they consider adoption at other deactivation sites throughout the Complex. The TBMS core software was upgraded to Microsoft Access 2000 in January 2001.

300 AREA CLOSURE PLAN (300 ACP)

The flexibility and power this system was demonstrated in FY 2000 when a multi-contractor team (Fluor Hanford, Inc., Bechtel Hanford Inc., and Battelle-Pacific Northwest National Laboratory) assembled a deactivation project basis of estimate utilizing the structure and informational modules available with TBMS. Of significance was the ability of the users to import cost information from several different tools including POWERTOOL, a deactivation endpoint determination software that is being used at multiple sites throughout the Complex. Having TBMS available at the onset of this project was of great benefit in that the team was able to quickly agree on the content and format of the product that was required for delivery. Access to this information database is included in the site Intranet rollout previously discussed in this paper.

Lessons Learned

The use of Crystal Software as the report writer for TBMS has reduced the flexibility and ease in developing / changing report outputs that have been requested by multiple users.

The inclusion of Crystal Report software added to the professional appearance of the reports available in TBMS but has restricted the ease in which new reports or variations of basic report formats can be gained. With a majority of available personnel resources being more familiar with

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Microsoft Access software and few Crystal Report software personnel available, a change in the report writer to Microsoft Access is being contemplated. Tests on alternate report generation capability are scheduled for FY 2001.