

WBS and Financial Plan Development for the NLC Project

Introduction and Overview
for the WBS Review

March 27, 2000

SLAC

Multiple Tracks

- Understanding the new machine configuration.
- Understanding the new cost estimating guidelines.
- Making new detailed cost estimates.
- Defining execution scenarios and timing of key milestones.
- Defining the structure, scope and boundaries of the work.

Planning Objectives

- Efficient integration of the detailed cost estimates into a Total Project Cost and Financial Plan by September.
 - Launch new WBS this week.
 - Roll up initial cost for 'Costing Workshop' April 24.
 - Rework costs for review May 18, and Collaboration Meeting May 31.
 - Rework costs and begin to schedule for September.

Goals for Today and Tomorrow

- Coordinators of WBS branches will explain the scope of work contained within each WBS boundary.
- We will look for omissions and overlaps.
- Open issues and questions will become 'action items' for future resolution.
- Each member of the group will begin to understand how their data and estimates flow into the WBS.

The Project WBS

- This work breakdown structure (WBS) is a hierarchical arrangement of the work required to deliver the final product to our customer.
- This WBS is *not*:
 - a parts breakdown structure (PBS) which emphasizes parts counts and other quantitative details.
 - an organizational breakdown structure (OBS) which is a hierarchical arrangement of a project's management structure.

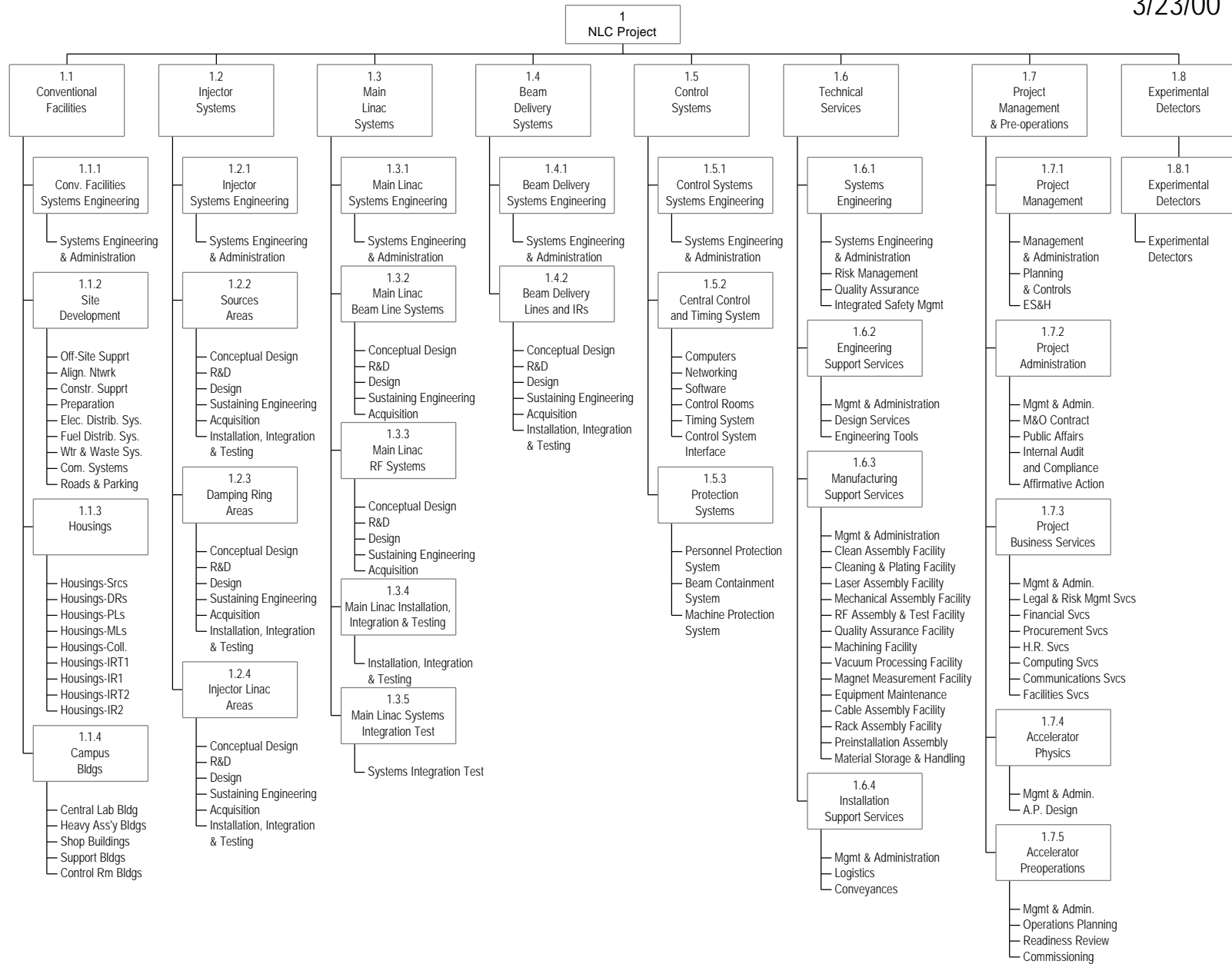
The WBS Objectives

- a compact view of the project that is easy for diverse readers to comprehend,
- simple to define and document choices and assumptions,
- emphasis on how the project will be executed and managed,
- outline of work processes such as design, acquisition, installation and testing, and support services,
- invariant with respect to changes of engineering models,
- include all work from authorization (CD1) through the completion of the construction project (CD4).

The WBS Levels

- Level 1 contains the roll-up of all work in the project.
- Level 2 contains the branches for each major scope of work.
- Level 3 breaks down the branches into smaller scopes of work.
- Level 4, the terminal element, contains the most finely defined work deliverables.

3/23/00



Element 1.6.1.1 'Systems Engineering and Administration'

- Conventional Facilities, Injector Systems, ML Systems, BD Systems, Control Systems, Technical Systems
 - Overall systems planning and documentation for the branch, including liaison with the centralized Project Management and Engineering Management Groups.
 - Development of facility requirements.
 - Management and integration of interfaces such as those involving 'sibling' Level-3 elements, and the rest of the project.
 - Support of the personnel working on the branch, including management and supervision of in-house staff, direction of consulting contracts, office support, computing support, etc.
 - Documentation tasks.
- The 'Chief Systems Engineer' lives in element 1.6.1.1

Some Definitions of Level-4 WBS Elements

WBS Element	DOE Phase	Deliverables	Definition
Conceptual Design	CD1-CD2	Conceptual Design Report, Plans, and Review	This element collects the conceptual design activities for the parent element, commencing after CD1, and concluding with completion of the Conceptual Design Report and Review, just prior to CD2. Conceptual design includes systems analysis of requirements, interfaces, manufacturability, reliability, maintainability, cost and schedule, etc.
R&D	CD1-CD4	Pre-production prototypes	This element collects the R&D activities in support of construction of the parent element at any time during the project, limited to demonstration of technical feasibility and engineering development of preproduction components, equipment, subsystems and systems. R&D does not include the development of working prototypes or components that will be installed in the NLC.
Design	CD2-CD3	Preliminary Design and Review; Definitive Design and Review	This element collects the engineering design activities for the systems, subsystems and components of the parent element. Engineering design shall include appropriate systems engineering (such as requirements analyses, systems integration planning, design for manufacturability, reliability, availability, maintainability, etc.) and documentation including procurement plans and cost and schedule estimates. Design also includes the development of working prototypes that will be installed in the NLC. The engineering support infrastructure is provided by Element 1.6.1.

Some Definitions of Level-4 WBS Elements

WBS Element	DOE Phase	Deliverables	Definition
Sustaining Engineering	CD3-CD4	As-built documentation.	This element collects the post-design phase (after CD3) engineering, inspection, construction management, systems integration, and pre-operational maintenance activities (Title-III EDI&A) for all systems, subsystems and components of the parent element. Sustaining Engineering includes both office support and field services.
Acquisition	CD3-CD4	Components ready to install.	This element collects the acquisition activities for the technical systems, subsystems and components of the parent element such as purchasing (by subcontract) or manufacturing in-house (using direct labor and materials). These activities occur during the construction phase, starting after CD3. The engineering and manufacturing support infrastructure is provided by Element 1.6.
Installation, Integration and Testing	CD1-CD4	System ready to commission.	This element collects the activities for planning and carrying out the installation, integration and testing of technical systems, subsystems and components of the parent element. Activities span the period from CD1 to CD4. The installation support infrastructure is covered by Element 1.6.

The WBS Dimensions

- Branches
 - correspond to level 2
- Functional Teams
 - centrally managed resources that are employed throughout the branches
 - examples are skills such as:
 - design
 - engineering
 - contracting
 - project management
 - installation

Classifying the Work of Functional Teams

- specifically assigned to a scope of work within a branch, or
- “global” support such as:
 - overall management of the functional team
 - equipment and infrastructure used by the functional team
 - coordination of project-wide issues

The Project Financial Plan

- Provides detail at a level appropriate for project management, the high-energy physics community and DOE.
- Includes the following components:
 - Project Summary WBS, dictionary, activity schedule and resources
 - Total Project Cost and funding profile to facilitate requesting funds
 - Staffing profile
 - Source documents keyed to WBS
- Snapshot view to be periodically re-synchronized with the constantly evolving detailed sub-schedules, cost estimates and actual costs.

The Structure of the Financial Plan

WBS level 4

Activity

Resources:

Labor hours

Labor dollars

M&S dollars

1.4.2.5 Beam Delivery Lines & IRs

Acquire magnets

Resources to make or buy the magnets:

Roll up of labor hours, labor dollars and M&S dollars as estimated by the participating functional teams and Area specialists.

Initial Development of the Financial Plan - Objectives

- Provide a 'rough' cost estimate within a model framework for management to assess the overall cost status of the project.
- Implement a new WBS with the scope of work clarified and documented.
- Generate high-level activities which can in the future be:
 - drilled down into finer detail,
 - scheduled and linked,
 - coded with relevant flags for sorting / reporting multi-dimensionally.
- Quantify high-level resources based on currently available detailed cost estimates.

Initial Development of the Financial Plan - Process

- Clarify / document the scope of work in each block of the WBS.
- Define a list of activities for each level 4 of the WBS.
- Quantify resources for each activity based on the detailed cost estimates provided by the functional teams and area specialists.
- Consolidate the data for management review.
- Analyze / clarify the data for the costing workshop at the end of April.
- Integrate the findings of the costing workshop into the WBS, activities, and estimated resources for review in mid-May and the collaboration meeting at the end of May.

Future Development of the Financial Plan - Objectives

- Begin scheduling by milestones, eventually leading to a linked, resource-loaded schedule that will be used to level the resources and funding profile.
- Continue to capture the reworking of detailed cost estimates into the financial plan on an iterative basis. Optimize the process.
- Develop relevant coding of activities by unique attributes:
 - Cost type (EDI&A or B&H).
 - Funding type (Construction or R&D).
 - Project phase (CD1-CD2, CD2-CD3, or CD3-CD4).
 - Estimator.
 - Future functional team (Magnet Team, Vacuum Team, BPM Team, ...).

Possible 'Functional Team' Code Attributes for Activities

(Working list of possible future teams)

- Local Area Teams
- Project Systems Engineering Team
- Project Management Team
- Vacuum Team
- Magnets Team
- Movers & Girders Team
- Cable Group
- Kickers Team
- LLRF (RF Controls) Team
- Modulators Team
- RF Sources Team
- BPMs Team
- Collimators, Dumps, Optical Anchors Team
- Special Instrumentation Team
- Installation and Alignment Team
- Manufacturing Support Team
- Commissioning Team
- Conventional Facilities Team
- Controls Software Team
- Controls Hardware Team
- Other Teams (for check summing)

Goals of the Review Process

- The group will participate together to understand the scope of work contained within each WBS boundary looking for omissions and overlaps.
- The group will constructively capture open issues and questions as 'action items' for future resolution.
- Each member of the group will begin to understand how their data and estimates flow into the WBS.