B61-12 Life Extension Program
Project Controls System Overview

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Sandia National Laboratories
Deputy Program Manager
B61-12 Life Extension Program

- **Purpose:**
  - Address aging issues and ensure service life requirements are met
  - Reduce maintenance intervals
  - Assure compatibility with legacy / modern aircraft

- **Primary Objectives:**
  - Maintain military effectiveness
  - Consolidate B61 modifications
  - Improve safety and security
  - Reduce NNSA/DoD cost of ownership over the life of the system

- **Schedule:**
  - First Production Unit 2020
  - Production Complete 2024

- **NNSA Cost Estimate $8.1B ($7.3B + $0.8B other programs)**
Projects all roll up into the B61-12 *Program*

Each Agency Represents an individual *Project*

- SNL DA
- LANL DA
- KCP PA
- SRS PA
- SNL PA
- LANL PA
- Y12 PA
- PX PA

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>NNSA</td>
<td>National Nuclear Security Administration</td>
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<tr>
<td>SNL</td>
<td>Sandia National Laboratory</td>
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<tr>
<td>LANL</td>
<td>Los Alamos National Laboratory</td>
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<tr>
<td>KCP</td>
<td>Kansas City Plant</td>
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<tr>
<td>SRS</td>
<td>Savannah River Site</td>
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<tr>
<td>PX</td>
<td>Pantex</td>
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<tr>
<td>DA</td>
<td>Design Agency</td>
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<tr>
<td>PA</td>
<td>Production Agency</td>
</tr>
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</table>
In the past:

- **Scope managed by Product Realization Teams (PRTs):**
  - Deliverable hand-offs and organizational interfaces
  - Handoff Milestones and PRT Schedules – driven by need dates

- **Cost estimates for labor:**
  - Dominated by level-of-effort support

- **Schedule/budget performance:**
  - Measured by milestones and adherence to spend plan
  - Limited rigor in programmatic total float/critical path calculations

Drivers for change:

- **US Congress/GAO**
  - Higher fidelity estimates for scope, schedule, and budget
  - Deliver proposed scope on-schedule and on-budget

- **NNSA Defense Programs Initiative 2012**
  - Mandated resource-loaded Primavera Schedules, EVMS implementation
NA-19 B61-12 LEP Management System Mission

- Implement a Project Controls System that will facilitate effective scope, schedule, and budget management
  - Baseline resource-loaded, logically-linked primavera schedules for each agency – includes technical scope from PRTs
    - Establishes Performance Measurement Baseline (PMB)
  - NNSA Integrated Master Schedule (NIMS) in Primavera
    - Captures logic strings for all products, across all agencies, from concept through production, providing accurate critical path calculations
  - Earned value management system (EVMS) tailored for weapon acquisition projects
    - Provides performance data & mandates in-depth root cause analysis, mitigation strategies, forecasting and formal change control
Present and Future:

Agencies manage:
- Scope, schedules, and budgets using PMB
- Project/Program Managers and CAMs balance scope, schedule, and budget with technical input from PRTs

Cost estimates for labor:
- Dominated by discrete activities from resource-loaded schedules

Schedule/Budget performance:
- EVMS and milestone delivery by project and at program level based on PMB
- Electronic roll-up (summary) of agency schedules into NNSA Integrated Master Schedule (NIMS) provides integrated programmatic information
- Milestones driven by schedule logic to early dates
- NIMS provides up-to-date programmatic critical path information
- Program PMB based on roll-up of project PMBs
B61-12 LEP PCS Requirements

- **Project Controls System Description (PCSD) “The What”**:  
  - B61-12 LEP EVMS (Structured by ANSI-748 Category)  
    - Organization; Planning, Scheduling, & Budgeting; Accounting; Reporting; Change Control  
    - Includes compliance matrix to ANSI-748 Guidelines  
  - B61-12 LEP Schedules  
    - Milestones; Design and Production Agency Schedules; NNSA Integrated Master Schedule (NIMS); Joint Integrated Master Schedule (JIMS)  
  - B61-12 LEP Integrated Baseline Reviews (IBRs)

- **Project Controls Manual (PCM) “The How”**:  
  - Processes, procedures, and templates for how requirements are met

Representatives from Each Agency Chartered to Develop PCSD & PCM - Garnering Consensus, Buy-in, & Programmatic Support
Sandia Design Agency Scope

 Responsible for:

- System engineering integration of the complete weapon
- All non-nuclear components of the nuclear weapon
- Technical Basis of the weapon qualification for War Reserve
- All trainers, handling gear
- Surveillance and sustainment of the system upon entry into the inventory to assure that it remains safe and militarily effective
In the past:

- PRTs managed cost, schedule and technical performance somewhat independently
- Programmatic performance evaluated using milestone achievements and tracking to a spending plan
- Inconsistent level of detail and organization methodology in schedules
  - 60,000 activities, thousands of interdependencies—complex network of interlinked activities preventing critical path analysis
- Schedule linkage management loosely controlled
Systems Engineering Approach to Schedule Reconstruction and Resource Loading

- Concept of Operations
- High-Level Requirements
- Detailed Requirements
- Design
- Implementation
- Maintenance
- System Verification
- Subsystem Verification
- Integration

NATIONAL NUCLEAR SECURITY ADMINISTRATION OFFICE OF DEFENSE PROGRAMS
Keys to Success

- High-level philosophy in EVMS implementation:
  - Requirements and design solutions must benefit the organization
  - These benefits must be communicated repetitively to Managers, Leads, and Project Controls staff in order to change the culture and garner support for the EVMS

- Three factors leading to success:
  - Assure proper sizing of the EVMS
  - Develop an efficient schedule architecture
  - Establish a Program Business Rhythm
Assure Proper Sizing of the EVMS

- PMB schedule contains enough detail for critical path analysis, but not an overly complex set of network paths
  - Activities 2 weeks to 2 months in duration
  - Most activities lead to a handoff
  - Utilize Primavera “steps” for additional detail under discrete activities

- PMB resources dictionary composed of “generic” resources instead of enterprise-wide resource list

<table>
<thead>
<tr>
<th>Resource Dictionary</th>
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<tbody>
<tr>
<td>Smith, John 16 2624</td>
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<tr>
<td>ENGINEER TEST 16 2624</td>
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<tr>
<td>ENGINEER TEST 16 2600</td>
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Develop an Efficient Schedule Architecture

- Schedule construction guidance provides criteria for a consistent architecture
  - Provide schedule templates—starting point for schedule construction
  - Establish activity and step requirements
    - Activities 2 weeks to 2 months; one step per month
  - Establish standard activity and convention for naming milestones

<table>
<thead>
<tr>
<th>WBS</th>
<th>Component MC-X</th>
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<tr>
<td>01</td>
<td>6.3 Development Engineering CA-Control Account</td>
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<td>'01</td>
<td>Technical and Project Management WP-Work Package</td>
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<td>Design WP-Work Package</td>
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### Establish a Program Business Rhythm

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Charter</th>
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<tbody>
<tr>
<td>Customer - NNSA</td>
<td>Direction, Requirements, Visibility</td>
</tr>
</tbody>
</table>
| B61-12 LEP Program Manager - all at CAM and Control Account Level | • Manage Management Reserve  
• Allocate CAM Budgets  
• Establish Key Performance Metrics  
• Monitor performance at CAM and Control Account level  
• Sets Schedule for Reviews  
• Monitor, Review and Approve artifacts (VARS, Corrective Actions, etc.)  
• Review and Approve Change Requests |
| Control Account Manager - all at Control Account and Work Package | • Develop detailed Control Account Plans  
• Conduct twice monthly schedule status  
• Identify and analyze problems  
• Develop workarounds  
• Produce monthly EV metrics  
• Perform variance analysis  
• Exercise tradeoffs  
• Determine corrective action plans  
• Report performance to CAMs and PM  
• Develop Change Requests |
| Tech Leads and Supporting EVM Staff (Financial Analyst, Schedulers) | • Develop detailed Control Account Plans  
• Conduct twice monthly schedule status  
• Identify and analyze problems  
• Develop workarounds  
• Produce monthly EV metrics  
• Perform variance analysis  
• Exercise tradeoffs  
• Determine corrective action plans  
• Report performance to CAMs and PM  
• Develop Change Requests |
# Program Business Rhythm

## October 2014

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<td>CAM Quad/Schedule Review - rescheduled from 9/24</td>
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<td>Mid-Month Schedule Status</td>
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<td>CANCELLED: CAM Meeting</td>
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<td>CANCELLED: Quad Chart Rvw</td>
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<td>Tech Leads Review EV Data and Develop Variance Reports (VARs)</td>
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<td>CAMs Review EV Data / VARs</td>
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<td>Generate and Distribute Month End EV Reports/VARs</td>
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<td>Review Key Milestone Handoff Report with PRTs</td>
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<td>NIMS Passback</td>
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<td>CAM Meeting</td>
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<td>Generate Handoff Spreadsheet</td>
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<td>Reporting Schedules Available</td>
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<td>Merge/Distribute Handoff Spreadsheet</td>
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<td>CAMs Review EV Data / VARs</td>
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<td>SITE REVIEW AT KCP</td>
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<td>Month End Schedule Status</td>
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<td>Critical Path Available on SCN</td>
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<td>Enter ETCs (starting at 1PM)</td>
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**CAMs**

**Schedulers**

**Tech Leads**

**PCAs**

**Ev Team**

**NNSA Deliverables**

**Reviews**

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**Notes:**

- INTEGRATED BASELINE REVIEW (IBR)
- SITE REVIEW AT KCP
- Critical Path Available on SCN
Project Controls Tools

- Monthly EV Report
- Critical Path Report
- Hardware Delivery Report
- Test Execution Report
- Baseline Variance Report
- Headcount Reports
Integration of EVMS Tools

Reasons EcoSys was Chosen
- Flexibility
- Scalability
- Highly Configurable
- Access/Data Control
- Future Tool Advancements
- Broad Capabilities over Multiple Functional Areas

Implementation
- EcoSys Consultant was onsite
- Regular interaction throughout development
- Defined functionality and system requirements
- Had dedicated implementation team with knowledge of our specific configuration
- Defined Success

Lessons Learned/Pitfalls
- Understand impacts of Custom Configuration and allow time for testing
- Define Business Practices and Cycles in Stage 1 of Development
- Own Process, Procedures, and Tool
- Early Report Development (prior to Production)
- Allow for 3 months of high-fidelity testing and review of data
- Focus effort and resources on your specific implementation/configuration
Program Realizing Early Benefits

- **Managing Program to an integrated schedule**
  - Master schedule used in all meetings
  - Critical path driving decisions and utilization of risk mitigation funding
  - Internal/external handoffs clearly identified and key topic in reviews

- **Schedule and cost integration**
  - Cost impacts of schedule delays/gains understood
  - Over/Under-runs recognized earlier
  - Resource issues clearly highlighted – headcount

- **Earned Value rigor driving attention to planning**
  - Variance analysis exposes impacts of deviating from plan
  - Duration and resource estimates improving
Resource-Loaded Integrated Master Schedule System

NIMS Provides Programmatic Life Cycle Schedule and Critical Path

Resource-Loaded Site Schedules Provide EV Data & Analysis Plus Site Critical Path

Alignment between Site Schedules and NIMS Maintained by Monthly Electronic Status Updates & Feedback Loop
B61 LEP Project Controls System

- **Agency EVMS/SAR**
  - Schedule/EV Status by Activity
  - Project EV Analysis at WP Level, Reporting at CA Level
  - WP=Work Package, CA=Control Account, AC=Actual Cost, SAR=Selected Acquisition Report
  - CPM=Critical Path Method, VAR=Variance Analysis Report

- **Agency/Project EVMS**
  - AC by WP
  - Resource-Loaded Project Schedules

- **Program EV Analysis at CA Level, Reporting at Summary Account Level**
  - NNSA/Program EVMS
  - Program EVMS/CPM Analysis/Reports

- **Unclassified**

**Classified for Some Agencies**

- **LANL DA**
- **LANL PA**
- **SRS**
- **Y12**
- **SNL DA**
- **SNL PA**
- **KCP**
- **PX**

**Schedule Status Updates**

**Program Critical Path Analysis**

**NIMS**

- **LANL**
- **SNL**

- **PA**
- **SAR**
- **KCP**

- **PX**

- **Unclassified**

- **classified**
Indications of Progress

- Project/Program EV and Schedule focus;
  - Timely variance/issue identification by WBS and Organization
  - Detailed, documented, and timely analyses
  - Proactive management action

- EV nomenclature established in team vernacular
  - Full understanding and utilization of EV, PV, AC, PMB, BCR, Cost Variance, Schedule Variance, Critical Path, Total Float

- Technical/Scope discussions include potential impact on schedule and budget for both product and program
  - Recognition of the variance/poor-planning connection driving improved schedule/cost estimate quality

- Recognition by project teams of value added from EVM/Schedule Management Rigor
  - Enhanced integration, coordination, and forecasting
Process for Developing the PCS

1. Set PCS Goals
2. High Level PCS Requirements
3. Gap Analysis at each Site
4. Charter EV & Schedule Teams
5. Establish Project & Program PMBs
6. Conduct Training at each Site
7. Issue PCM (Process Steps)
8. Issue PCSD (Detailed Requirements)
9. Establish NIMS
10. Test, Review & Refine
11. Perform IBRs at each Site
12. Continuous Improvement
B61-12 LEP Schedule Hierarchy

Tier 1 and 2 Milestones

Joint Integrated Master Schedule (JIMS)

NNSA Integrated Master Schedule (NIMS)

Project Schedules
NIMS Roll-up Mechanics

Relationship Between NIMS & Example Project Schedule

NIMS Activities/Milestones for other projects can be represented & Statused in both the NIMS and in affected other project schedules to provide feedback loop.