



Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831-6474

Date: August 8, 2003

To: Thom Mason, Associate Laboratory Director for SNS

Subject: **DOE Review of SNS End Game Plan**

The final report of the subject review is attached. The review committee very much appreciated the cooperation and support of the SNS Project staff in the conduct of the review. If there are any questions, please do not hesitate to call me.

A handwritten signature in black ink that reads "Les Price".

Les Price
DOE Project Director, SNS

cc
Pat Dehmer, DOE-HQ/BES
George Malosh, ORO
Carl Strawbridge, SNS

Review committee and observers:

Jeff Hoy, DOE-HQ/BES
Jim Yeck, DOE-FNAL
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Final Report

DOE Review of the SNS

End Game Plan

July 9-11, 2003

August 8, 2003

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Executive Summary

- Thom Mason and the SNS Project Team are to be commended for completing the End Game Plan in such a short time. The review committee was unanimous in its view that SNS has a strong management team
- The BA plan achieves the goal of consistency with the approved funding plan, although some planning assumptions still require validation.
- The line item Estimate at Completion (EAC) has continued to grow since the May review. Remaining contingency has dropped from \$44.6M in May to \$34.9M, with the threat of an additional reductions up to \$12M from identified risk areas that were judged to have greater than 50% likelihood of occurring. This condition is considered by the review committee as marginal, and will require more aggressive management to keep the project on track.
- The Pre-Ops ETC has been re-evaluated with the result that \$6.7M of management reserve now exists.
- Several key transition areas will require close management attention:
 - Partner Lab staff roll-off
 - Merger of Conventional Facilities and Project Support organizations into the “Complex Facilities and Support Organization”
 - Project closeout and transition into operations in FY2006
- The review committee endorses the general aspects of the plan for further development and submission to DOE in time for implementation by September 30, 2003.

Introduction

During the May 2003 Office of Science review of SNS (Lehman Review), it was recognized that the aggressive internal schedule aimed at completing the project 6 months earlier than the official schedule resulted in BA requirements higher than the budget in FY04. This resulted in two action items: (1) the SNS Project Team should prepare an “End Game Plan” that resequences project activities to better match the approved funding plan, and (2) this plan should be reviewed by DOE. The plan was submitted on July 3, 2003 and reviewed July 9 – 11, 2003. The charge letter is provided in Appendix A. Members of the committee are given in Appendix B. This report contains the conclusions of the review.

In summary, the proposed plan defers the early finish date from December 2005 to March 2006 and defers a number of non-critical path activities from FY 2003-04 to FY 2005 and FY2006. In addition, some actions referred to as “scope reductions” were taken. It should be noted that this does not mean a reduction in the facility capability with respect to commitments to Congress or senior management of the Department. They should be considered as scope optimization or value engineering actions. As currently designed and being constructed, SNS will deliver significantly more “scope”, i.e. science capability, than the baseline design that supported the original project approvals and Congressional commitment.

Technical Systems

Findings and Comments

The following paragraphs address the Accelerator Systems Division (ASD) & Experimental Facilities Division (XFD) reports presented at this review. In each case the first three paragraphs address the end-game resequencing including our comments on the plan’s credibility, and consistency with CD-4 criteria. Following are our comments regarding potential cost increases (Risks) that may draw down contingency; comments on spares, and on the PreOps plan unique to ASD and XFD.

Accelerator: (WBS 1.3, 1.4, 1.5, 1.9)

Scope Reduction:

- None

Deferrals:

Significant partner laboratory deferral issues are:

- LANL BA for HEBT cavities reduced by \$0.8M in FY04
- JLab not deferred in any way
- BNL BA reduced by \$0.9M in '04 until '05

Specific component deferral issues presented are:

- The rf cavities and rf system installation in the HEBT line. \$1M is deferred until '05/'06.
- Controls, \$1.8M BA deferred from '04 to '05/'06
- Power Supplies and Diagnostics, 0.9M\$ deferred from '04 to '05/'06
- Schedule changes, slipping installation and commissioning milestones moves \$3.0M from '04 to '05/'06.
- Total accelerator deferrals from '04 to '05/'06 is \$6.7M

Comments:

The plan is credible. The committee supports the decision to not defer any partner lab work related to the linac. The deferral of the HEBT rf system is reasonable in that it is not needed for low power operation. The argument that it is not needed for up to 1MW is convincing. The schedule slips introduce some risk, but the remaining float and commissioning durations in the end-game plan are consistent with most projects of this scope. An impact of the slip is that Davis-Bacon (DB) labor is reduced in '04 and increased in '05/'06 while maintaining the integral. The DB labor plan is efficient with a smooth roll-off.

With respect to ASD staff, if the resequenced plan works to level the required effort, moving effort from '04 to '05/'06 consistent with the shift in scope. The personnel profile does not include any large swings in required FTE's, and the project is well aware of the inefficiencies such swings would introduce.

The committee's concern with the end-game plan is the same as that noted by the project, namely to ensure that the "partner labs don't see this as an opportunity to extend their schedules too".

Risk:

We were shown cost risks totaling \$15M, as well as the methodology for deriving this number. We carefully questioned these numbers, particularly for the linac. The project vigorously defends the numbers. The two most visible problems (drift tube linac and low level rf) have been mitigated and costs increases are incorporated into the baseline. Other areas noted as moderate risk are the High Voltage Converter Modules for the rf systems, and the 5MW klystrons. The CCL cavities are not considered a risk by SNS management.

The committee remains concerned that future contingency draws in Accelerator Systems may be as large as \$15M if there are unforeseen problems. If significant problems occur in Accelerator Systems, consuming contingency, there are no identified scope reductions, beyond the HEBT cavities and their installation, to cover overruns.

Spares:

All spares, except those identified as purely operational (e.g., filters) are purchased from line item funds. The project is prioritizing purchases from a long list of desirable spares. Since any further spares purchases will consume contingency, and since contingency is very tight, we support the projects decision to minimize these purchases. We acknowledge that the omission of critical spares introduces technical risk of achieving CD-4, and risk during early operation. However some spares procurements are being made as add-ons to the baseline procurements. This is a reasonable and efficient approach, but in the light of reduced contingency the project

should view spares as a source of technical scope reduction. We address this in a recommendation.

Pre-Ops:

The endgame plan includes effort moving smoothly from construction to pre-ops to operations. Additionally, the power budget, dominated by ASD during Pre-Ops was previously overestimated due to assumptions about higher duty cycles than are now anticipated. An ETC of Pre-Ops identifies \$8.6M of savings in utilities and \$6.7M overall.

Experimental Facilities: (WBS 1.6, 1.7)

Scope Reduction:

None

Deferrals:

Procurements and installation costs for the target and instruments totaling \$8.97M are deferred from '03/'04 into '05/06.

Comments:

Delaying target procurements and installation matches the March '06 project schedule for meeting CD-4 criteria. Sufficient float remains for "Integrated Systems Testing", and the Accelerator Readiness Review, which is needed for CD-4 operation. The target facility Operations Readiness Review will be done subsequent to CD-4. Delaying the instrument #4 and #5 procurements eliminates the option that instruments #4 and #5 will be operating in March 2006, while meeting the requirement that the components of the instruments are received by ORNL. The committee feels this is a credible approach to matching the obligations to the BA without compromising the overall schedule.

Risk:

During the presentations the committee was shown items totaling \$11M identified as risk. Of this \$9M is in the Target and \$2M in Instruments. Our questioning revealed that the Division Director believes the risk to be less than this, on the order of \$5-7M. These items are all being actively evaluated and in some cases mitigated (or mitigation plans exist).

A prior technical risk concerning potential cavitation induced erosion of the Mercury (Hg) target has been evaluated by the project as well as by technical and advisory committees. The conclusion is that for both CD-4 and normal operating conditions this will not be an issue. Mitigation strategies have been identified for future implementation, beyond 1.0 MW operation. Components associated with these strategies that cannot be retrofitted are now included in the baseline.

A current target risk concerns potential cost increases associated with fabrication of the inner reflector plug, due to complexity of the design (potential impact ~\$2M). The procurement package for this item is ready to go out for bid, with bids expected by the end of this fiscal year. At that time, project management will evaluate the bids and decide whether it is necessary to implement the mitigation strategy of using a simpler design, and so mitigation of this risk cannot be incorporated into the EAC/Endgame plan at this time.

Due to the three month delay in target building completion, target installation has also been delayed three months, but so has the early completion date (moved from December '05 to March '06 as part of the Endgame plan). The target installation schedule risk and critical path have not changed with the Endgame plan, but schedule remains tight with ~one month float. However, a three month readiness assessment period, which includes a practice operational readiness review not required for CD-4, is considered to provide schedule contingency for target installation.

Regarding instruments, it was indicated that instrument components can be deferred such that sufficient capability can be maintained, while retaining the possibility of future upgrades to increase capacity. This is considered to provide adequate flexibility to address potential risks from increases in instrument costs.

Spares:

The XFD plans to purchase only spares that are essential to ensure CD-4, and which have a long lead-time for purchase. There is \$522k in target spares already in the baseline. An additional \$583k in target spares considered critical for CD-4 have been included in the EAC/Endgame Plan (with BA required in FY05). The target spares list includes an additional (wish list) \$3.85M for spares considered to be important, but not critical for CD-4, nor included in the EAC. The XFD and target system management is comfortable with the spares included in the baseline and the EAC, and indicated that the EAC list was developed after critical review by engineers and meetings with project management. As a result of that review, many items were judged not to be critical and were left out of the EAC.

Regarding the instrument systems, flexibility in how instruments are built along with the availability of prototype parts and multiple quantities of key components (e.g. detectors, DAQ) is considered to obviate the need for spares.

Pre-Ops:

The Experimental Facilities Division has identified a staffing plan that smoothly transitions from project to Operations.

Recommendations:

1. Revise the project cost and schedule baselines to incorporate the endgame plan by September 30, 2003.
2. Reevaluate all uncommitted spares purchases in the baseline, those identified in the EAC, and other requests, in order to develop additional contingency.
3. Report on (at next DOE review) cost and schedule variances in ASD installation activities.

Conventional Facilities

Findings and Comments

The End Game plan has sufficient level of completeness and detail to represent a valid path forward to the completion of the SNS project. Work plans have been modified in CF activities to reflect the BA planning objectives; however the assumptions supporting the plans can not be validated at this time. Near term resolution/validation of these assumptions is required to determine if the “swing items” are sufficient to resolve any issues. We find that several assumptions require immediate resolution to validate the claim of avoiding a FY2004 BA profile problem.

Examples of assumptions that require validation are:

- The AE/CM deferral of fee into FY2006.
- The Target building BOD deferral – dependent on a negotiated settlement with the construction contractor for acceptance of a planned \$4M deferral into FY2005.

Potential scope changes were reviewed and \$7M in scope contingency is identified. However, until the assumptions surrounding the end game plan are validated there is no way to ascertain if the \$7M is adequate or if additional scope reduction is required. The plan is sufficient if the assumptions hold true.

The issue of staff transition requires specific management attention to skill mix and leadership in CF activities as the new CSO organization emerges and construction activities conclude.

There are sufficient levels of detail in the planning of CF activities to determine credibility of deferred scope plans and scope reduction efforts. \$2M in scope reduction and \$9M in deferral were reviewed and found to be supported by credible estimates. As mentioned above, immediately validating the project assumptions supporting the plan will have a significant effect on implementation. We find that the proposed scope reductions are reasonable, CD-4 objectives

for CF activities remain unchanged, and Level 0 milestones are unaffected. Additionally, the issue of spares is not a significant project impact topic for CF activities, however attention must be paid to the ORNL operations transition and the facility use agreement to avoid excess operations costs associated with facility related maintenance and spares.

The committee notes that CF risk assessment is focused exclusively on contract risks. Risks associated with staff transition, such as title III services, should be assessed and may lead to a need for further scope reductions.

The project critical path is unchanged through the Target Building construction, installation and commissioning. One month of float remains between completion of Target commissioning and early project completion. The IPS schedule extension positively affects CF activities. The net effect is a reduction in the level of schedule risk and a better balance in CF activity completion.

Baseline costs are based on March '03 baseline and supported through contract values. Some contract assumptions need to be validated through negotiated results. The EAC appears valid if assumptions hold. Contingency draws have been historically significant, but not out of line with other similarly complex projects. Nothing about the end game plan changes this parametric.

Recommendations

1. Validate End Game planning assumptions affecting CF implementation in time to support swing item implementation.
2. Update End Game plan to reflect any changes and incorporate into Project baseline plans by September 30th.

Management

Findings

The SNS management team presented an End Game Plan that reduces requirements for Budget Authority (BA) by roughly \$25 million in FY 2003 – 04; is based on a new version of the Integrated Project Schedule (IPS); and is consistent with the approved SNS funding profile. Appendices C and D illustrate the BA requirements compared with the Approved BA Funding before and after the proposed changes. The specific actions are provided in Appendix E - Summary of End Game Plan Scope Reductions and Deferrals.

The End Game Plan moves the SNS project's early finish date from December 2005 to March 2006 (three months earlier than the June 2006 CD-4 milestone date in the Project Execution Plan). The project critical path remains unchanged: Target Building construction and Target Systems installation. The combination of deferred items to reduce FY 2004 – 2005 BA requirements, schedule delays, and extending the early finish date by three months to March 2006 results in slightly more explicit float in the IPS critical path schedule (~1 month). The consequence is less time to respond to major problems that might be encountered during installation and commissioning (i.e., more time to accomplish the necessary work, but less time and flexibility available to deal with problems).

The Plan budgets both line item and operating expense funded activities through the March 2006 early finish date. This reallocates some operating expense funds budgeted in the current baseline to support Pre-Operations activities during March – June 2006 to instead support an extension of line item activities during January – March 2006. The latter activities were not previously budgeted in the baseline after December 2005. The estimated costs associated the BA deferrals amount to ~\$5 million, and are partially offset by \$2.1 million of scope reductions in Conventional Facilities.

The Plan also includes elements identified as “swing items”, which could be acted upon should either additional contingency usage be necessary in FY 2004 – 2005 or if any of the Plan's major assumptions cannot be confirmed (e.g., deferral of the AE/CM's remaining incentive fee). The FY 2004 swing items are delays to portions of the Central Laboratory Office (CLO) Building and will depend on negotiations with the CLO Building subcontractor.

SNS management also identified items totaling \$7.2 million that could potentially be used in the future as scope contingency if existing contingency funds become exhausted. These consist of procurements for Instruments #4 and #5, and procurement/installation of the HEBT cavities and waveguides.

Comments

The End Game Plan is reasonable and provides an adequate basis for project decision-making today. The plan must be developed further including the resolution of important planning assumptions and the revision of the detailed project schedules.

The Committee agreed with the strategic goals and priorities used to develop the End Game Plan, e.g., a priority was made to hold schedules for completing construction activities at the partner laboratories. The Committee noted that the schedule depends on the partner laboratories meeting their delivery milestones.

A critical planning assumption is the deferred commitment of the AE/CM fees until FY 2006. While preliminary indications are that this is feasible, additional consultations need to be made along with negotiations with the AE/CM to confirm this aspect of the Plan. This should be expedited.

The End Game Plan is based on a revised Estimate-At-Completion (EAC). The new EAC results in a contingency budget that the Committee judged to be marginal. The successful

implementation of the Plan will require more aggressive management of baseline and contingency budgets.

There has been a good effort to identify scope contingency items. This type of analysis should continue and be expanded to include consideration of the existing list of approved spares as discussed elsewhere in this report.

The updated Estimate-to-Complete (ETC) for Pre-Operations resulted in the creation of a budget reserve of \$6.7 million. This reserve is essential and should be tightly managed and preserved as long as possible.

The real end game is in FY 2006. It is important to lay the groundwork now to ensure successful completion of the construction project and an effective transition to operations. SNS management should work to create as much flexibility as possible to prepare for responding to future cost increases, schedule delays, and technical challenges.

Staffing plans for operations and the transition to operations require detailed arrangements between SNS Divisions and agreements with ORNL. SNS should proceed to establish the proper agreements and arrangements now. The most pressing case appears to be in Conventional Facilities where construction is now two-thirds complete.

Recommendations

1. Revise the project cost and schedule baselines to incorporate the elements of the End Game Plan by September 30, 2003.
2. Provide monthly updates on the status of contingency budgets and plans to DOE.

Appendix A



Department of Energy

Oak Ridge Operations
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June 3, 2003

Jeff Hoy, DOE-SC, BES
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Rod Gerig, ANL
Pepin Carolan, DOE, FNAL Site Office
Dale Knutson, ANL

Subject: “End Game Plan” Review – Charge to Panel

First, let me thank you for agreeing to serve on this review. It is a key element in maintaining management confidence that the SNS Project will meet its objectives.

The SNS Project Team has been asked to re-sequence remaining activities to better match the approved funding plan. This is referred to as the “End Game Plan”. The review panel charge is to assess the credibility of this plan. The review will include the following elements.

Activity definition

- Is the proposed plan complete, i.e. do the Integrated Project Schedule (IPS) and cost estimates identify all-important activities necessary to complete the project?
- Is the approach for spares reasonable?
- Are any proposed changes to project scope technically reasonable and consistent with CD-4 criteria?
- Have potential scope changes, within the CD-4 criteria but not in the proposed plan, been identified which might be exercised at some future date if contingency draws exceed expectations?

Activity sequencing

- Is the critical path realistic and consistent with the proposed IPS completion date?
- Are other tasks reasonable from standpoint of duration and sequencing?

Resource estimates

- The proposed plan will include provision for (1) baseline costs, (2) cost increments reflecting EAC, and (3) realistic allowance for future contingency draws. (The working definition is that EAC is management’s most realistic estimate for work that is essentially certain to occur. Other potential cost increases are captured in the risk assessment that supports the estimate of future contingency draws.) Are these estimates realistic?
- Are BA and BO requirements defined at sufficient level of detail for review and are they credible?
- Are the BA requirements consistent with the approved funding plan?

A detailed agenda will be provided later, but you should assume that we will begin at 8:00 am on July 9 and conclude by 11:30 am on July 11. Also, the Project Office will set up a web site and post information there for advance review.

Again, I appreciate your support and look forward to working with you.

A handwritten signature in cursive script that reads "Les Price".

Les Price
DOE Project Director
SNS

cc:

Pat Dehmer, DOE-SC, BES
George Malosh, DOE-ORO
Dan Lehman, DOE-SC, CMSD
Thom Mason, SNS
Carl Strawbridge, SNS

Appendix B

**Department of Energy Review
of the
Spallation Neutron Source (SNS) Project
July 9-11, 2003**

Les Price, DOE, Chairperson

Conventional Facilities

Dale Knutson*, ANL

Technical Systems

Rod Gerig*, ANL
Pepin Carolan, DOE, FNAL Site Office
Jim Kerby, FNAL

Management

Jim Yeck*, Chair
Jeff Hoy, DOE-SC, BES

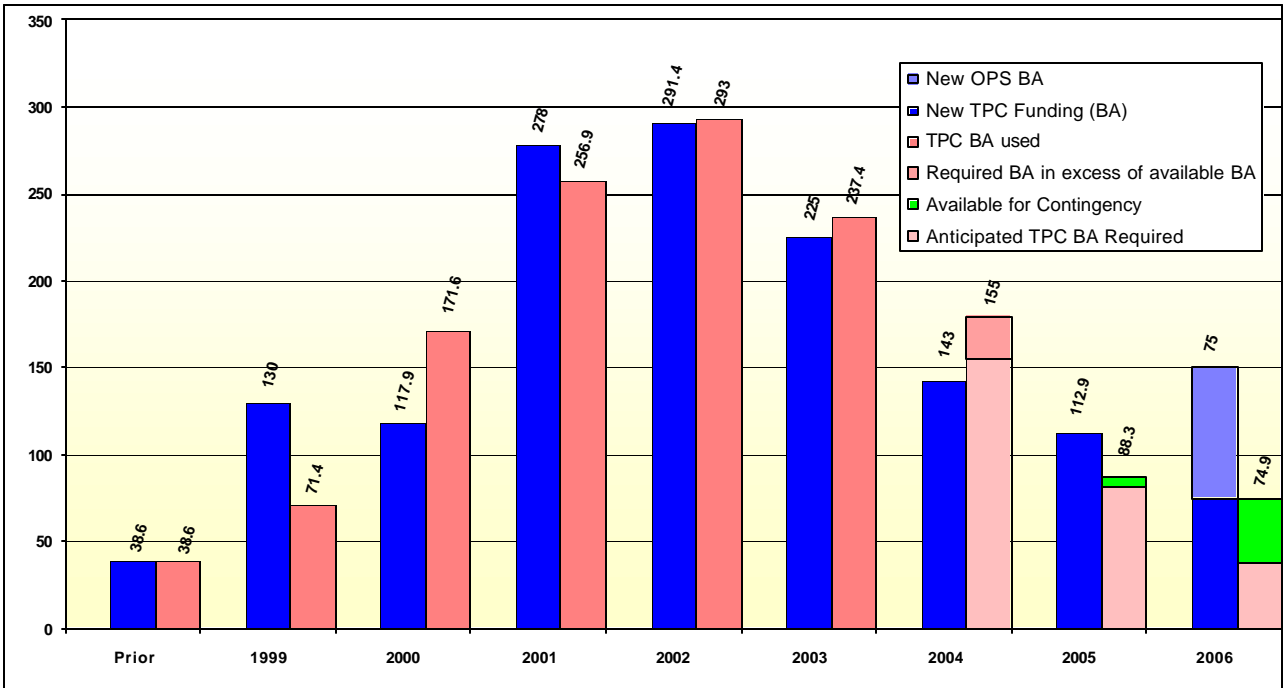
Working Observers

Dan Lehman, DOE-HQ
Larry Radcliffe, DOE-ORO
Dave Wilfert, DOE-ORO

* Chairperson of sub-team

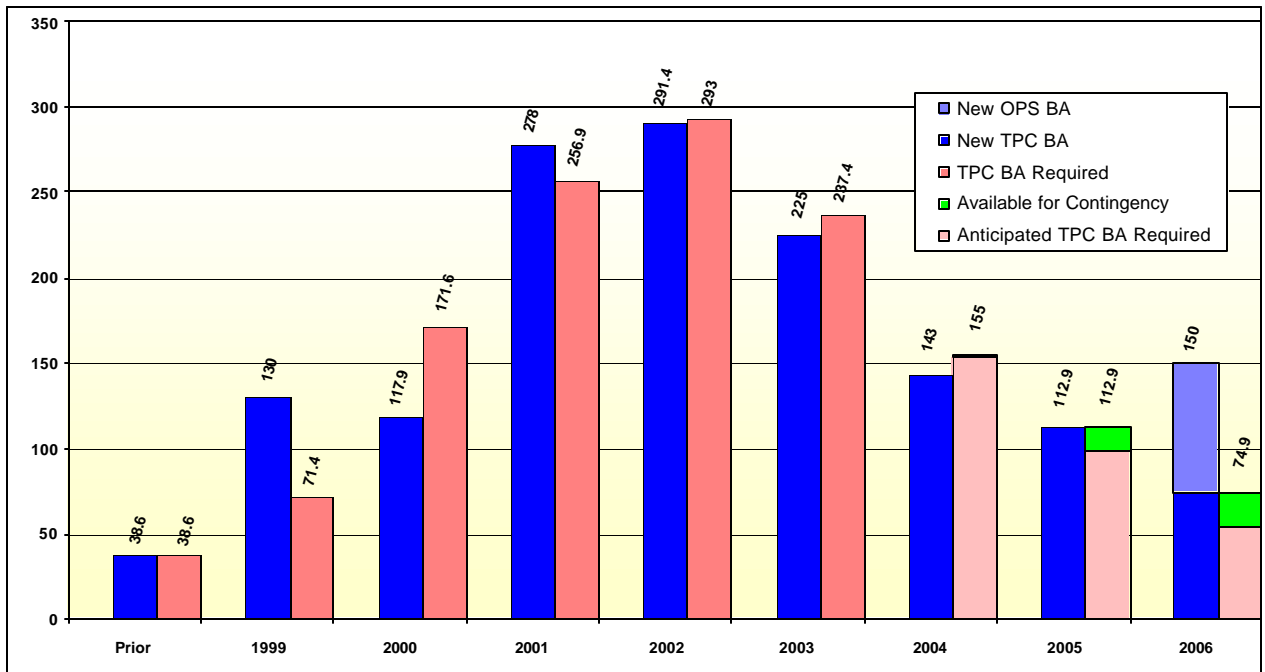
Appendix C

BA Requirements vs Approved BA Funding Plan-Prior to End Game



Appendix D

BA Requirements vs Approved BA Funding Plan-Based on End Game



Appendix E

Summary of End Game Plan Scope Reductions and Deferrals

Proposed Annual Adjustments by Division	FY03/ 04	FY05	FY06	Added Cost
Conventional Facilities				
Scope Reductions				
Eliminate paving of some roads not critical to installation		(0.5)		
Eliminate procurement/installation of one of two process waste collection tanks	(0.7)			
Reduce bridge between CLO and Target Bldg to minimum functionality	(0.8)			
Shrink construction site under CM access control	(0.5)	(0.3)		
Temporary trailers removal/site restoration		(0.2)		
Deferred Items				
Delay Target Bldg BOD and associated systems (fire alarm, backbone, I&C) to 2/05	(4.7)	6.9		2.2
Additional crane operation and maintenance cost during extended construction period		0.1		0.1
CF and CM staff during extended construction period		1.0		1.0
Additional cost for general construction services during extended construction period		0.4		0.4
Defer payment of FY03, FY04, and FY05 AECM incentive fee to FY06	(2.3)	(5.4)	8.0	0.3
Defer CF I&C for various buildings	(0.1)	0.1		0.02
Pave only roads needed for installation	(0.9)	1.0		0.12
Delay procurement/installation/operation central exhaust facility	(1.0)	1.0		
Total Conventional Facilities Division	(11.0)	4.2	8.0	4.1
XFD				
Deferred Items				
Delay procurements for Instruments 4 & 5 until FY05 and/or FY06	(5.7)	1.7	4.4	0.4
Delay some minor Target procurements	(1.7)	1.0	0.7	
Delay target hot cell installation 3 months	(1.5)	1.6	0.0	0.05
Total Experimental Facilities Division	(8.9)	4.3	5.1	0.5
ASD				
Deferred Items				
Delay HEBT cavities/waveguide procurements and installation from FY03/04 to FY06	(1.0)		1.0	
Some BNL work scope (Ring Systems & Controls) moved to FY05 to be consistent with revised Ring installation/commissioning schedule	(2.7)	1.6	1.3	0.2
Complete installation of SC Linac and Ring moved to FY05	(2.0)	2.0		
Delay accelerator procurements (control room equipment, lab equipment, office supplies, operations spares, cryogenics)	(1.0)	1.0		
Total Accelerator Systems Division	(6.7)	4.6	2.3	0.2
Total Annual Changes	(26.6)	13.0	15.4	4.8