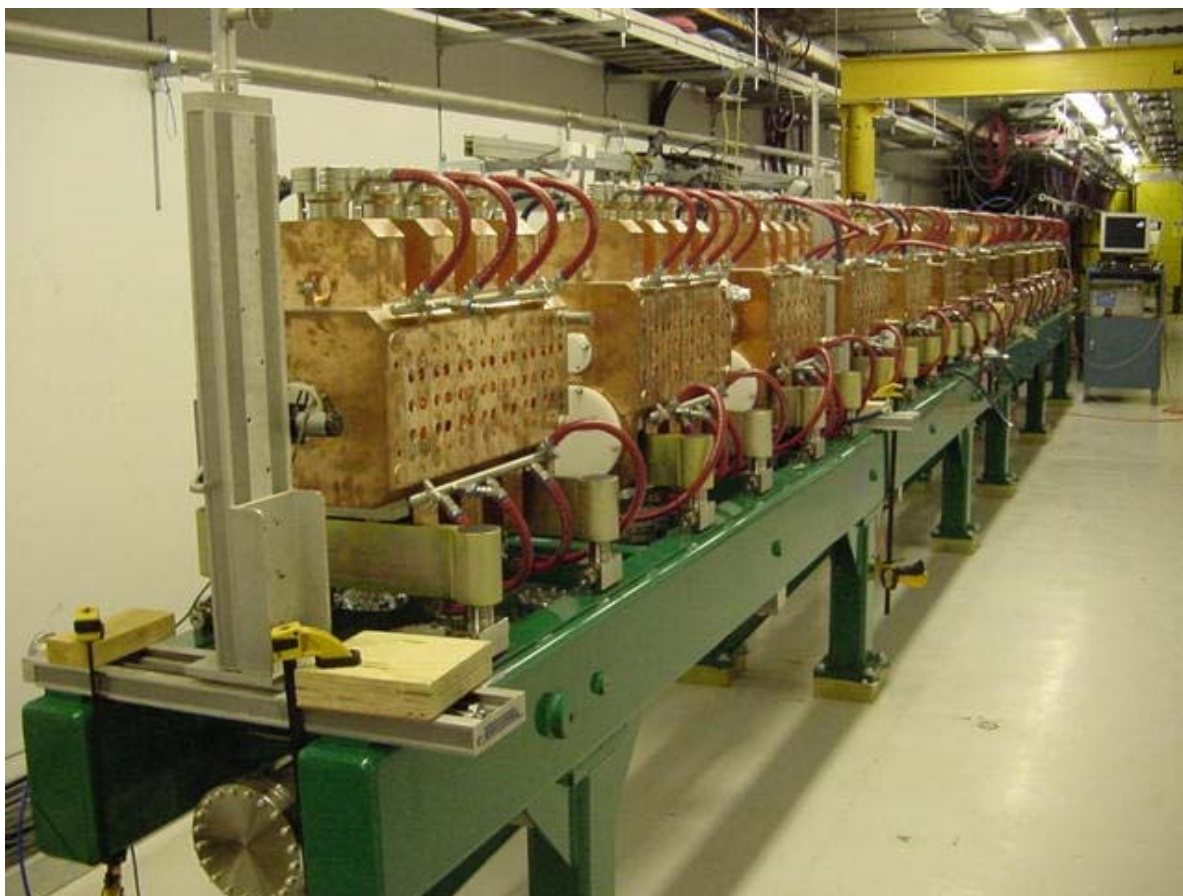


# The Spallation Neutron Source Monthly Report

November 2003



A U.S. Department of Energy Multilaboratory Project

SPALLATION NEUTRON SOURCE  
Argonne National Laboratory • Brookhaven National Laboratory • Thomas Jefferson National Accelerator Facility • Lawrence Berkeley National Laboratory • Los Alamos National Laboratory • Oak Ridge National Laboratory





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## Project Overview and Assessment



<b>Technical Assessment:</b>	Satisfactory
<b>Cost Assessment:</b>	Satisfactory
<b>Schedule Assessment:</b>	Satisfactory
<b>Overall Assessment:</b>	Satisfactory

CCL 1 RF structure and bridge coupler

*Carl N. Strawbridge*  
 Carl N. Strawbridge  
 SNS Deputy Project Director  
 1/6/04  
 Date

### Highlights:

- Good project performance continues with minor cumulative schedule and cost variances against the March 2006 early finish schedule. Through the end of November 2003, 74.6% of the project is complete. Completion percentages are:
  - ◊ 97 % of R&D
  - ◊ 93 % of design
  - ◊ 69 % of technical hardware (including procurement and fabrication)
  - ◊ 79 % of conventional construction
  - ◊ 44 % of installation
- The available contingency balance of \$44.8M will be reduced to \$30M once the changes identified in the Estimate at Completion are incorporated into the baseline.
- Excellent safety performance continues. As of November 28, 2003, the Project has worked in excess of 2.7 million hours with 44 recordable injuries (no change from last month) and no lost work day (away) cases. The project is working with DOE, TDEC and the EPA to resolve questions regarding the air permit for the central exhaust system. The Target Safety Analysis has been completed and sent to DOE.

### Assessment and Issues:

**Accelerator Systems Division (ASD):** The drift tube production is successfully nearing an end with all 210 drift tubes shipped to ORNL by the end of December. ORNL has received the first 12 Drift Tube Linac (DTL-2) permanent magnet drift tubes. The “dummy” drift tubes have been removed from DTLs 1 and 3 in preparation for the installation of the 4 new Electromagnetic Dipoles (EMDs) in DTL-1 and DTL-3 as well as the 2 new Beam Position Monitors (BPMs) in DTL-3. Alignment of the installed DTL-4 drift tubes is being completed in preparation for tuning the tank over the holidays. The LANL-ORNL team completed installation and tuning of Coupled Cavity Linac (CCL) Module-1. The entire Low Level RF (LLRF) system is operational. Five additional medium beta cavities were qualified during the beginning of December. The first two transmitters for the Superconducting Linac (SCL) have been successfully commissioned. The first 12-pack of SCL klystrons were successfully operated and commissioned up to 69.5kV, 10.8A and 1.35ms pulsewidth at 20 Hz. The first six klystrons were operated successfully. The High Energy Beam Transport (HEBT)-Ring-Ring-to-Beam-Transport (RTBT) installation continues to go well. The installation of the HEBT momentum collimator steel shield plates was completed. The Ring Half-Cell No.15 (Unit C9) was received and staged for installation. Installation of the magnet cables from the Ring Service building to the Ring Tunnel is continuing and installation of the cable tray in the RTBT tunnel has begun.

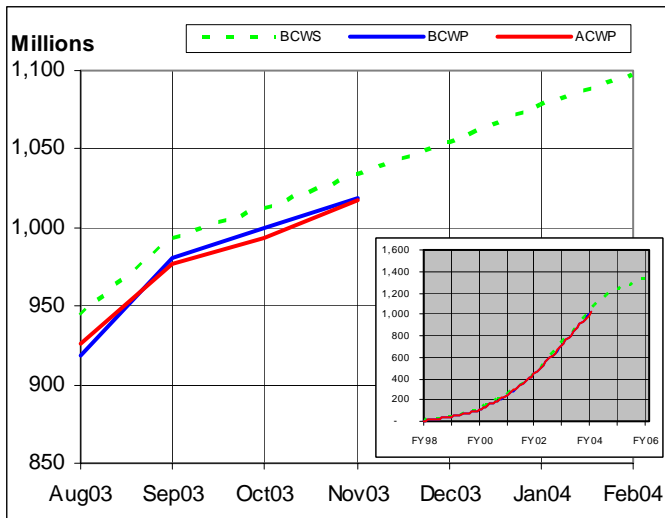
**Experimental Systems Division (XFD):** The Target Building contractor has completed the initial concrete pours for the guide/shielding supports in the Beamline 2 building between the Target and Spectrometer Buildings. The Start Instrument Instal-

lation milestone is ahead of schedule with installation anticipated during the last week of January 2004. The first large ring of the Target Systems Pan Shielding has been delivered and the final revision of the procurement drawings and specification for the Ring Injection Dump beam stop and vacuum window have been completed. The portable manipulator mobile positioner was shipped from Germany and will be equipped with the completed manipulator interface package in January. The contract for plating the cadmium test articles has been awarded and best and final offers for the Inner Reflector Plug fabrication have been evaluated.

**Conventional Facilities (CF):** An aerial topography survey was performed to assist in determining the final cut and fill soil balances on the site. This will help formulate the strategy for the management of the stockpile of soil located in the area of the possible second target building. Settlement of the RTBT Tunnel is measured weekly and input to a finite element geotechnical model that will anticipate future tunnel behavior. The Ring Tunnel Liner installation is complete except for the final topsoil and seeding. The high-bay and south low-bay roofs of the Target Building are nearly complete and the structural steel installation has been declared substantially complete. Forming for the concrete roof and for the second lift of the hot cell north wall and the south wall has begun. Concrete has been placed in the floor of the process bay in preparation for installing the target cart rail support plates which support the target carriage. Work is on schedule to meet the April 12, 2003 date for hot cell equipment installation. Dry-in of the CLO building is slightly behind schedule but the contractor is working on a 60-hour-week schedule to complete the work as soon as possible. Drywall installation continues as weather and progress in other areas of the building permit.



Project Overview and Assessment (con't)



Total Project	Nov03	Cum-to-Date
BCWS	20,601	1,033,496
BCWP	19,468	1,019,087
ACWP	23,167	1,016,883
CV	-3,699	2,204
SV	-1,134	-14,409
CPI	0.84	1.00
SPI	0.94	0.99
<b>Budget at Complete</b>	1,366,913	
<b>Contingency</b>	44,787	
<b>Total Project Cost</b>	1,411,700	

<b>Total Project Cost (TPC)</b>	<b>\$1,411.7 M</b>
Percent planned (cumulative)	75.6%
Percent complete (cumulative)	74.6%
<b>Total Estimated Cost (TEC)</b>	<b>\$1,192.7 M</b>
Cost and Commitments through 11/30/03	\$957.3M
Outstanding Phase Funded Awards	\$60.4M
Budget to Complete	\$190.6M
Contingency	\$44.8M
Estimate at Completion	\$1,162.7M
Remaining Contingency Based on EAC (~20%)	\$30M

**Critical Path:**

Based on the March 30, 2006 completion date, no activities in the project schedule show negative float at this time.

The project's critical path is concentrated in the Target area and runs through Target Building construction work supporting the Hot Cell installation. While there is no single area in the target schedule that shows negative float, there is only one month of positive float to the March 30, 2006 early finish date. Thus, the schedule will be monitored closely to insure that there are no delays in the loading of Target Mercury, conducting the integrated startup testing of the Target systems and completion of the Target Readiness Assessment. These activities require that the Hot Cell installation work proceeds on schedule with an April 2004 start date.

**Milestones:**

Description	Milestone Date	Forecast Date
CD-1 Mission Need	Aug-96	Aug-96 ✓
CD-2 Baseline Approved	Dec-97	Dec-97 ✓
CD-3 Begin Construction	Nov-99	Nov-99 ✓
CD-4 Project Complete	Jun-06	Mar-06



## Linac Systems– Los Alamos National Lab



Preparation for CCL2 fabrication at the vendor

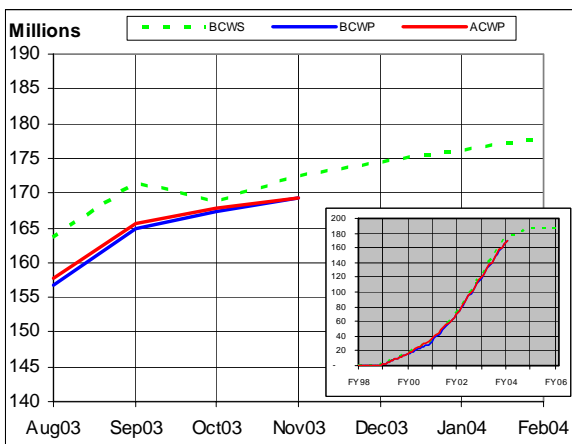
### Highlights:

- The first 5-MW *Thales* klystron for the CCL was accepted at LANL and shipped to ORNL. With the other 5-MW components shipped in October, the first set of CCL RF power equipment is now at ORNL. During October, *CPI* shipped four more SCL klystrons (S/Ns 39-42) to ORNL. Factory acceptance tests for the first two *Thales* 550-kW SCL klystrons have been completed and the klystrons have been shipped to LANL for site tests.
- The production high-voltage converter modulator (HVCM) operated satisfactorily to support klystron testing. After ~750 hours at full voltage and average power and ~ 4,000 total hours, the prototype HVCM was pulled out of service for inspection. All assemblies generally seem to be problem free, with only modest carbonization observed in a few small spots on the rectifier racks and lid. The prototype switch plate assemblies are being rebuilt with improved IGBT bypass capacitors.
- Revision B of the LLRF Field Control Module (FCM) hardware was successfully used on DTL Tank-1 in November, including a record 1-mA average beam current operation at 60 Hz. The first four units of the high-power protect (HPM) production run were received by LANL, shipped to ORNL, and found to be fully functional. The entire production documentation, including board schematics and firmware, was turned over to ORNL, completing LANL deliverables on the HPM system.
- Following tuning at the factory in late October, the vendor *ACCEL* delivered the first CCL module to ORNL in November. LANL led the final tuning and installation of this module at ORNL. *ACCEL* is making good progress on the remaining modules, although they are several weeks behind schedule. Weekly management conference calls are helping to identify solutions for making up the schedule slippage.
- The LANL diagnostics team continued to complete and ship hardware and electronics to support DTL and CCL commissioning. Fourteen BPM electronic chassis were assembled, tested, and shipped to ORNL. The remaining DTL wire-scanner actuators are being tested at LANL prior to delivery, and all linac wire-scanner electronics chassis were delivered to ORNL. The remaining energy-degrader/Faraday cup actuators and electronics are undergoing final tests at LANL. A target harp design review was held in December.

### Assessment/ Issues:

The key concern at this time is the CCL module delivery schedule. Close vendor oversight will be continued.

### Performance and Milestones:



	Nov03	Cum-to-Date
BCWS	3,520	172,393
BCWP	1,900	169,360
ACWP	1,423	169,295
CV	478	65
SV	-1,619	-3,033
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CPI	1.34	1.00
SPI	0.54	0.98
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<b>Budget at Complete</b>		186,253
<hr/>		
<b>Planned % Complete</b>		92.6%
<b>Actual % Complete</b>		90.9%

### Cost Performance:

*Cause and Impact:* None required  
*Corrective Action:* None required

### Schedule Performance :

*Cause and Impact:* The schedule variance is largely due to delayed delivery of production klystrons as well as RF windows.  
*Corrective Action:* Several of these large dollar items arrived in December and this will be reflected in the December report. Continued vendor liaison will be performed to ensure the schedule and quality of deliverables is maintained.

Description	Milestone Date	Forecast Date
Linac Design Complete	Sep-02	Apr-02



Cryomodule 7 assembly

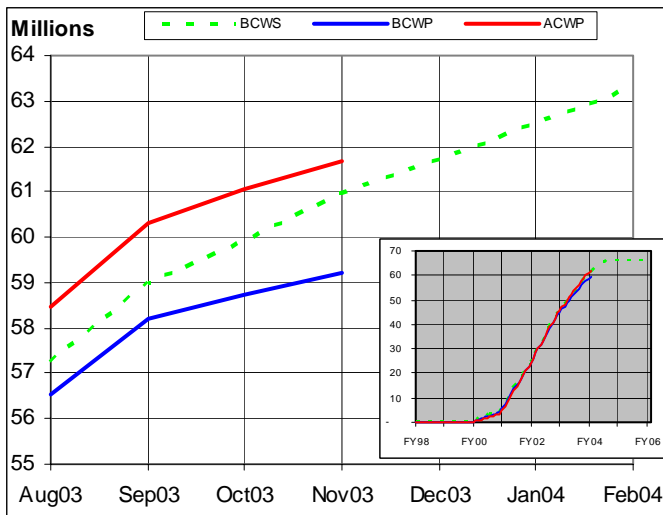
**Highlights:**

- Four medium beta cavities were qualified this month. All cavities required for cryomodules M-8 and M-9 have been qualified.
- String assembly for cryomodule M-8 was completed and assembly of cryomodule M-7 continued.
- Testing of cryomodule M-5 was completed. All cavities met specifications for gradient and Q<sub>o</sub>. Testing of cryomodule M-6 has begun.

**Assessment/Issues:**

The cavity qualification processes have been modified in accordance with the recommendations of the external review committee. This has resulted in an increased cavity qualification yield but at an additional cost. The spring ETC will include actions to minimize this growth.

**Performance and Milestones:**



	Nov03	Cum-to-Date
BCWS	1,086	60,983
BCWP	470	59,218
ACWP	606	61,653
CV	-136	-2,435
SV	-616	-1,765
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CPI	0.78	0.96
SPI	0.43	0.97
<hr/>		
<b>Budget at Complete</b>		66,044
<hr/>		
<b>Planned % Complete</b>		92.3%
<b>Actual % Complete</b>		89.7%

**Cost Performance:**

*Cause and Impact:* The cumulative cost variance is a result of the additional effort required in the Medium Beta cavity qualification.

*Corrective Action:* Implementation of the new procedures appears to be having a positive effect. An ETC will be performed in the Spring of 2004 once a specific course of action (incorporating the results of the review and the test program) has been finalized.

**Schedule Performance:**

*Cause and Impact:* The cumulative unfavorable schedule variance results from the difficulty in maintaining a consistent cavity qualification process.

*Corrective Action:* See above corrective action.

Description	Milestone Date	Forecast Date
Linac Design Complete	Sep-02	Apr-02 ✓
Initiate Testing of Prototype Cryomodule	May-02	Apr-02 ✓



HEBT flight tubes

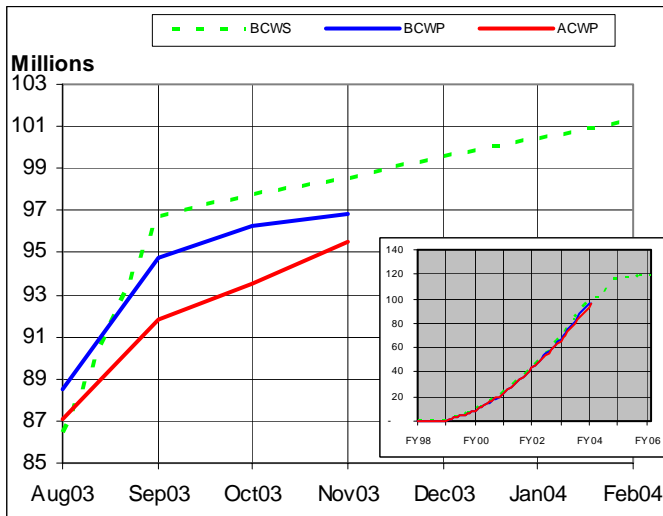
**Highlights:**

- The Ring dipole-quadrupole-corrector half-cells #13 and #14, the HEBT collimator stands, RF junction boxes, and castings for the vacuum support stands were delivered to ORNL.
- Due to scheduled facility maintenance and unscheduled repairs, the measurement station for SNS production magnets was shut down for more than three weeks. Once the power was restored, priority was given to the measurement of 30-cm ID quadrupoles. These coils were shimmed for realignment.
- BNL participated in the vendor’s test of the first production unit of the SNS extraction kicker pulse-forming-network power supply. The test was successfully conducted, lasting sixteen continuous hours at the operating current of 2.5 kA, voltage of 35 kV, and repetition rate of 60 Hz. This first production unit will be shipped to BNL for more extensive tests. Work on the remaining 13 units is in progress.
- Members of the power supply group visited the vendor to resolve various test issues related to the ring main dipole power supply and various medium-range power supplies.
- TiN coating of the vacuum chambers for the Ring collimators #2 & #3 is underway. These chambers were manufactured at SDMS. After coating, they will be shipped back to SDMS for final assembly in the collimators before being shipped to ORNL for installation.
- The accelerator physics and power supply groups continue to create database entries of ring magnets and power supplies, conforming to established naming conventions.

**Assessment/Issues:**

No issues to report.

**Performance and Milestones:**



	Nov03	Cum-to-Date
BCWS	794	98,588
BCWP	590	96,835
ACWP	1,966	95,536
CV	-1,376	1,299
SV	-204	-1,752
<b>CPI</b>		
CPI	0.30	1.01
<b>SPI</b>		
SPI	0.74	0.98
<b>Budget at Complete</b>		
Budget at Complete		118,504
<b>Planned % Complete</b>		
Planned % Complete		83.2%
<b>Actual % Complete</b>		
Actual % Complete		81.7%

**Cost Performance :**

*Cause and Impact:* The current period negative cost variance is the impact of the \$1.1M credit to the project that was declared complete in the month of November. This credit was the result of a reduced procurement burden on high value procurements. The cumulative cost variance is due to the fact that earned value has been declared upon receipt of procurements but the invoices will not be paid until the magnets are all inspected and qualified. Accruals are not permissible in the BNL accounting system.  
*Corrective Action:* None required

**Schedule Performance :**

*Cause and Impact:* None required  
*Corrective Action:* None required

Description	Milestone Date	Forecast Date
Ring Design Complete	Oct-03	Jul-03



## Target Systems– Oak Ridge National Lab



Interstitial shielding blocks on site ready for installation

### Highlights:

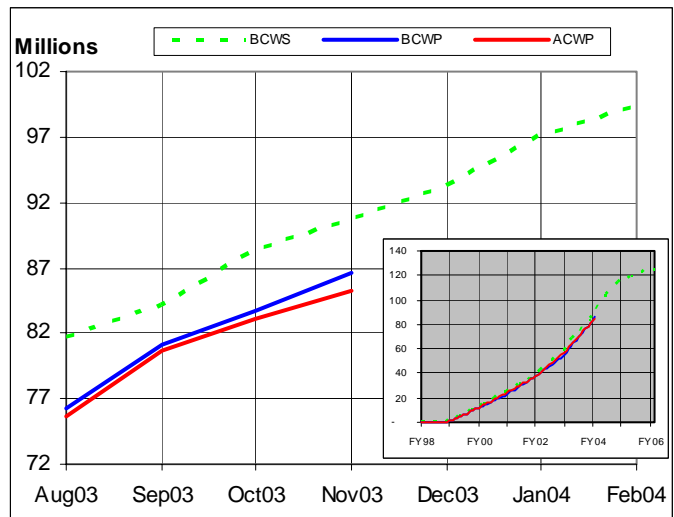
- A meeting was held with ASD representatives to finalize locations for the thermocouples that will be used for halo/beam position monitoring on the proton beam window.
- The first nine Interstitial blocks have been shipped to the SNS site.
- The Target Utility and Beam Dump Utilities Pressure Regulating Valve and Rupture Disk contracts were awarded. The lead times on these items will result in availability to the field in eight to twelve weeks, well within the schedule requirements.
- The Target Systems Utility Cart passed the final acceptance test at the vendor and is being shipped to Oak Ridge.
- Four pedestal manipulator baseplates were placed above the monolith as part of the first highbay floor concrete placement.
- The final factory acceptance testing for the hot cell video system has been completed. The system will be stored at the vendor site until the building is ready for installation.

### Assessment/ Issues:

With the delayed start of the Target Building General Construction, the installation schedule continues to be monitored closely. The Target Hot Cell Ready for Equipment (RFE) is the next major milestone and is on schedule.

### Performance and Milestones:

	Nov03	Cum-to-Date
BCWS	2,402	90,803
BCWP	2,824	86,586
ACWP	2,028	85,207
CV	795	1,378
SV	422	-4,217
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CPI	1.39	1.02
SPI	1.18	0.95
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Budget at Complete		124,682
<hr/>		
Planned % Complete		72.8%
Actual % Complete		69.4%



### Cost Performance:

*Cause and Impact:* The positive cost variance was caused by the completion of the crane/telemannipulator fabrication without receipt and payment of an invoice.

*Corrective Action:* None required

Description	Milestone Date	Forecast Date
Target Design Complete	Jun-03	Jun-03 ✓
Start Target Installation	Jun-03	Apr-03 ✓
Start System Test with Beam	June-06	Mar-06

### Schedule Performance:

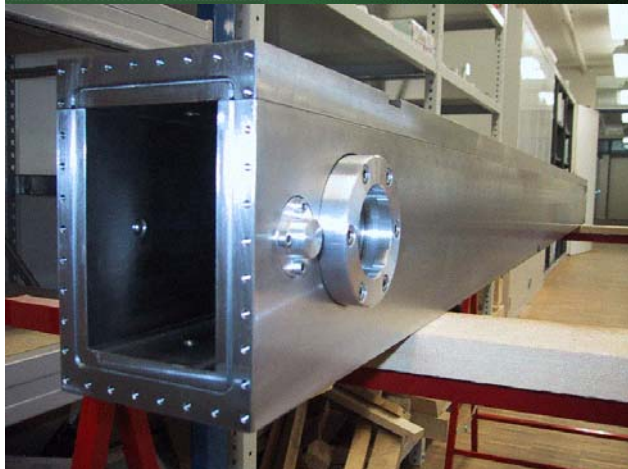
*Cause and Impact:* The cumulative schedule variance is due to delays in delivery of interstitial blocks and shutter guides as well as procurement and installation in the Target utilities area.

*Corrective Action:* The interstitial blocks are now arriving and none of these delays impact the project's longest path.





Instrument Systems– Argonne and Oak Ridge National Labs



Neutron guide housing for the Magnetism Spectrometer

**Highlights:**

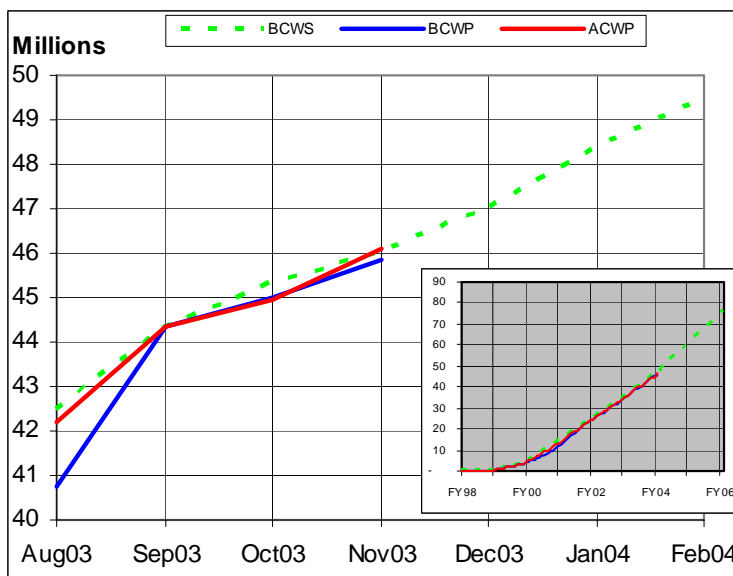
- Detailed planning for the Personnel Protection System (PPS) for the backscattering spectrometer has begun. Additionally, detailed discussions have been held with the PPS group regarding the secondary shutter for the two reflectometers.
- The kickoff meeting of the NeSSI analysis software working group was held on November 7, 2003.
- The vendor for the sample table for the liquids reflectometer has been selected.
- First time-of-flight neutron spectra were measured from the SNS source. A prototype 3He LPSD detector assembly was operated successfully at several positions near the front-end accelerator and both the prompt pulse and a delayed tail associated with partially-thermalized neutrons were observed.
- The Astrium bandwidth choppers for the Backscattering Spectrometer have been delivered and are prepared for acceptance testing at the Chopper Test Facility at Argonne.

**Assessment/** No issues at this time.

**Issues:**

**Performance and Milestones:**

	Nov03	Cum-to-Date
<b>BCWS</b>	708	46,052
<b>BCWP</b>	853	45,875
<b>ACWP</b>	1,118	46,086
<b>CV</b>	-264	-211
<b>SV</b>	146	-177
<b>CPI</b>		
	0.76	1.00
<b>SPI</b>		
	1.21	1.00
<b>Budget at Complete</b>		80,036
<b>Planned % Complete</b>		57.5%
<b>Actual % Complete</b>		57.3%



Description	Milestone Date	Forecast Date
Start Instrument Installation	Mar-04	Jan-04
Instrument Design Complete	Oct-04	Aug-04
Complete Subproject Acceptance Tests	June-06	Mar-06

**Cost Performance:**

*Cause and Impact:* None required  
*Corrective Action:* None required

**Schedule Performance:**

*Cause and Impact:* None required  
*Corrective Action:* None required



## Conventional Facilities– Oak Ridge National Lab



Target Building High Bay steel

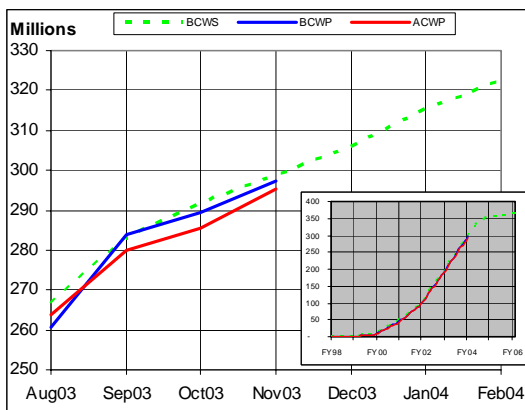
### Highlights:

- The Site Utilities subcontractor has completed installation of utility piping in all areas of the site and only punchlist items remain.
- Construction of the East and West Makeup Air Buildings and Ring Injection Dump is continuing with completion expected in January 2004. The Diversion Tank Building will be complete upon receipt and installation of some long lead time valves.
- RTBT Tunnel backfill and liner installation is underway.
- Installation of a number of storm drain pipes at the North ellipse road, East CLO parking lot and West CLO parking lot, is underway.
- The Hot Cell liner pan installation is continuing and construction work is progressing well in the basement level and south side instrument level areas of the Target Building.
- Fireproofing continues as well as piping, electrical conduit and cable tray installation and stud wall installation for the CLO General Construction. Siding, roofing and glass installation is also underway. Fire alarm installation is proceeding as well.
- The Instrumentation and Controls subcontractor continues testing and labeling of fiber optic cable and has begun installation of the fiber optic backbone to the Ring Service Building, which will be the last blown fiber work for FY04.

### Assessment/Issues:

The Target Hot Cell Ready For Equipment (RFE) date is currently forecasted for April 12, 2004, a critical date to ensure completion of target installation efforts. The CLO is currently forecasted to be complete October 7, 2004. However, project staff currently located off-site will move into portions of the CLO in June 2004.

### Performance and Milestones:



	Nov03	Cum-to-Date
<b>BCWS</b>	7,062	298,748
<b>BCWP</b>	8,037	297,261
<b>ACWP</b>	10,012	295,316
<b>CV</b>	-1,975	1,945
<b>SV</b>	975	-1,487
<b>CPI</b>	0.80	1.01
<b>SPI</b>	1.14	1.00
<b>Budget at Complete</b>		367,540
<b>Planned % Complete</b>		81.3%
<b>Actual % Complete</b>		80.9%

Description	Milestone Date	Forecast Date
Award AECM Contract	Nov-98	Nov-98 ✓
Start Site Work	Mar-00	Mar-00 ✓
BOD Front End Building	Dec-02	Oct-02 ✓
BOD 1000 MeV Linac	Apr-03	Dec-02 ✓
BOD Ring Tunnel	Aug-03	Jun-03 ✓
BOD Target Building	May-05	Feb-05
Construction Complete	Nov-05	Mar-05

### Cost Performance:

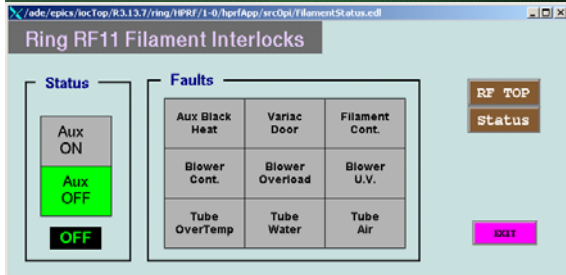
*Cause and Impact:* The positive cumulative cost variance is due to the inclusion and staturing of contract mods (including structural steel) in the baseline. Actual costs have not yet been incurred for these activities even though the work is completed. Accruals will be placed against these mods as soon as all the procurement work required has been completed.

*Corrective Action:* None required

### Schedule Performance:

*Cause and Impact:* The negative schedule variance is the result of behind schedule progress for CLO General Construction effort.

*Corrective Action:* None required



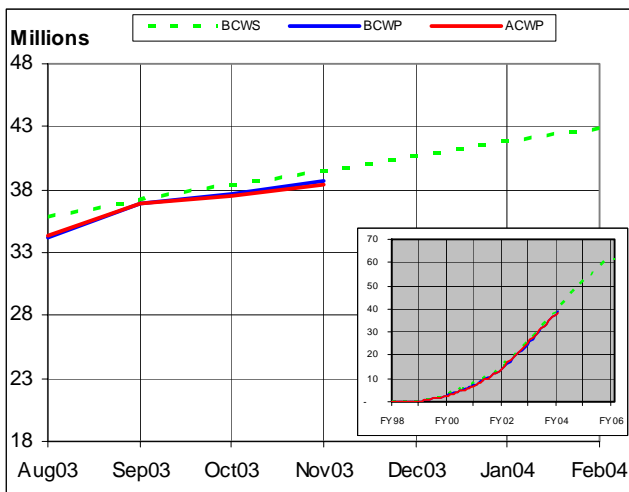
Ring HPRF screen

### Highlights:

- Checkout of all sensors and control devices for the Central Helium Liquefier Main Warm Compressors was completed. This coincided with the completion of the mechanical preparation of the compressors and gas management hardware. The compressors have been started by both the PLC controls as well as the EPICS screens. The control loops were easily tuned and stable operation was maintained for four hours. Overall, the EPICS system and archivers performed flawlessly.
- The following documents were completed: (a) vacuum control test plan, (b) a functional system description (FSD) and test plan for the collimator cooling water skids, (c) cable block diagrams for the HEBT, Ring and collimator cooling water skids, and (d) cable block diagrams and cable pull lists for the SCL vacuum system and cryomodules 1–4. A draft of a requirements document for operational screens (which will be applicable to other subsystems as well) was developed.
- With the conclusion of DTL operations, the BNL controls team initiated shutdown activities, including migration to EPICS R3.14.X for all development and deliverables. The BLM software was updated during the DTL-1 run. This software includes more responsive digital I/O and HV PS interfaces and more choices for BLM signal baseline subtraction.
- The Yokogawa EPICS software is considered complete at this time and documentation is under development. Yokogawa units have been deployed at the power supply vendor and are being used for acceptance testing of injection kicker power supplies.
- The first set of Ring HPRF screens have been developed in conjunction with the Ring HPRF group. These screens will be available for use with the Ring HPRF test stand currently being assembled at ORNL and expected to be operated by in the Spring of 2004.

**Assessment/Issues:** No issues at this time.

### Performance and Milestones:



	Nov03	Cum-to-Date
BCWS	1,062	39,523
BCWP	1,041	38,708
ACWP	897	38,440
CV	144	268
SV	-21	-815
<b>CPI</b>		
CPI	1.16	1.01
<b>SPI</b>		
SPI	0.98	0.98
<b>Budget at Complete</b>		61,337
<b>Planned % Complete</b>		64.4%
<b>Actual % Complete</b>		63.1%

#### Cost Performance:

*Cause and Impact:* None required  
*Corrective Action:* None required

#### Schedule Performance:

*Cause and Impact:* The schedule variance is due to delayed material procurements, particularly those in Ring controls.  
*Corrective Action:* None required. These procurements are not on the critical path.

Description	Milestone Date	Forecast Date
Start Front End Controls Installation	Oct-02	Jun-02 ✓
Global Controls Design Complete	Jan-03	Sep-02 ✓
Global Controls Subproject Test Complete	May-06	Mar-06



Ring half cells

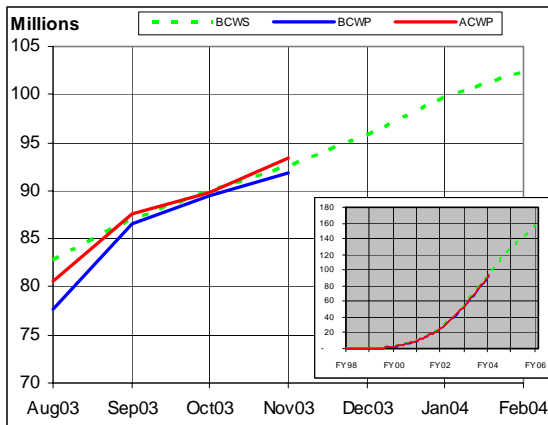
**Highlights:**

- Seventeen drift tubes (DT's) (out of a total of 27) have been installed in DTL-4. The DTL #5 tank has been leak tested and is leak tight. The first 15 (of 23) DT's for DTL-5 have been fiducialized, magnet mapped and leak tested . Cooling manifold installation has begun. DTL-6 vacuum seals are being prepped.
- The first RF module of the CCL was shipped to ORNL and plans have been made to reassemble the module in the linac tunnel.
- The installation of the RF system for CCL-1 has been completed and that for medium beta cryomodules #1, 2, 3 and 4 is nearing completion.
- The factory acceptance test for the 805-MHx 5.0-MW SN 1 klystron is complete and the tube has been shipped to ORNL.
- The two halo collimators have been installed in the HEBT tunnel along with their iron shielding. The first 21Q40 quadrupole was measured and installed in the HEBT tunnel.
- The Ring cabling continues to go well. All heavy cabling to the arcs has been completed. The lighter magnet corrector cable will be completed before the end of the calendar year, allowing installation of the half cells. The corresponding straight section cabling should be done by April 1. About two miles of heavy cable are pulled per week.

**Assessment/ Issues:**

Deliveries of CCL components are being closely monitored to determine potential impacts on installation and commissioning activities.

**Performance and Milestones:**



	Nov03	Cum-to-Date
<b>BCWS</b>	2,635	92,574
<b>BCWP</b>	2,432	91,854
<b>ACWP</b>	3,555	93,363
<b>CV</b>	-1,123	-1,509
<b>SV</b>	-203	-721
<b>CPI</b>		
	0.68	0.98
<b>SPI</b>		
	0.92	0.99
<b>Budget at Complete</b>		168,660
<b>Planned % Complete</b>		54.9%
<b>Actual % Complete</b>		54.5%

Description	Milestone Date	Forecast Date
Start Front End Installation	Sep-02	Jun-02 ✓
Start Linac Installation	Sep-02	Apr-03 ✓
Start Ring Installation	Aug-03	Jul-03 ✓
FE Beam Available to DTL	Mar-03	Dec-02 ✓
Linac Beam Available to HEBT	Aug-05	May-05
HEBT& Ring Beam Available to RTBT and Target	Feb-06	Nov-05

**Cost Performance:**

*Cause and Impact:* The cost variance is distributed amongst most of the ASD WBS elements. Most of the variance can be attributed to RF procurements that were received but not earned and Davis Bacon labor charges in excess of the plan.  
*Corrective Action:* The RF variances will be resolved as soon as status is taken and the Davis Bacon labor overrun is being investigated.

**Schedule Performance:**

*Cause and Impact:* None required  
*Corrective Action:* None required



CLO construction

**Highlights:**

- Erosion control systems were evaluated during the month. Systems continue to function well (in spite of occasional heavy rainfall) and contractor attention to detail has improved. As areas transition between contractors, there is an increased need to establish new controls (as well as maintain existing controls). This topic was initiated by a contractor and discussed at a weekly subcontractors meeting, demonstrating understanding and appreciation of this issue.
- The third quarter CY 2003 utilization data from SNS construction shows women at 5.8% project-to-date and 6.3% for the quarter and minorities at 7.5% project-to-date and 7.9% for the quarter. The target goals are 6.9% for women and 6.8% for minorities
- The SNS web site is being added as a link on the program’s site at [www.MarineForLife.com](http://www.MarineForLife.com). The USMC Marine for Life Program sponsors more than 27,000 Marines each year who are returning to civilian life. The program includes job assistance.
- An earned value management system verification by OECM is planned for late May. A scoping visit with OECM and DCMA is planned for February.
- On June 10, 2003, an application for a construction air permit for the SNS Central Exhaust Facility was submitted to the Tennessee Department of Environment and Conservation (TDEC) by the DOE. In reviewing the application, TDEC has recently questioned the timeliness of the submittal. At present, after numerous discussions, DOE personnel are requesting a teleconference be scheduled for early January, 2004 with TDEC personnel to resolve the respective regulatory concerns.

**Assessment/  
Issues:**

Managing within budget. Continuing strong focus on cost control and contingency management. The transition of work from LANL to ORNL (in preparation for the subproject completion in April 2004) is going well. CLO move-in preparation is also on track.

**External Review Data:**

Progress on External Review Recommendations in the month of November is as follows:

Review	Recommendations	Closed This Month	Open Actions
DOE End Game Review (7/03)	5	0	2
DOE SC Review (5/03)	29	1	4
DOE SC Review (11/02)	35	1	0

**Life of Project Market Experience:**

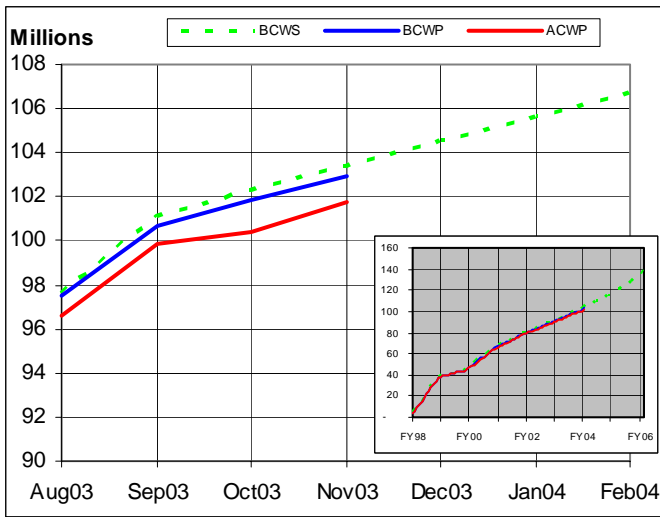
Major Awards (\$M)	Baseline Estimate (\$M)	Baseline Savings (\$M)	Percent savings over baseline
530.9	498.4*	-32.5	-6.5%

Through December 18, 2003: 95% of the major procurements already awarded.

\* The October report showed an incorrect baseline estimate number.



**Performance:**



	Nov03	Cum-to-Date
BCWS	1,055	103,373
BCWP	1,043	102,931
ACWP	1,382	101,780
CV	-339	1,151
SV	-12	-442
CPI	0.75	1.01
SPI	0.99	1.00
BAC (1.2)		75,603
BAC (1.10.3, 1.1.13, 1.10.5)		71,128
Planned % Complete		70.5%
Actual % Complete		70.1%

**Cost Performance Cum to Date:**

*Cause and Impact:* The cost variance is largely due to an error in the processing of the NOAA fees and improper phasing of move costs. The latter should have been isolated to June 2004 and rather was spread across FY04.

*Corrective Action:* The NOAA costs will be corrected in December. A PCR will be implemented to correct the move plan.

**Schedule Performance Cum to Date:**

*Cause and Impact:* None required

*Corrective Action:* None required

**Milestones:**

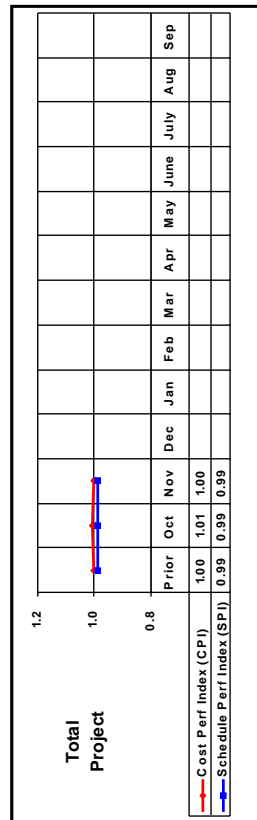
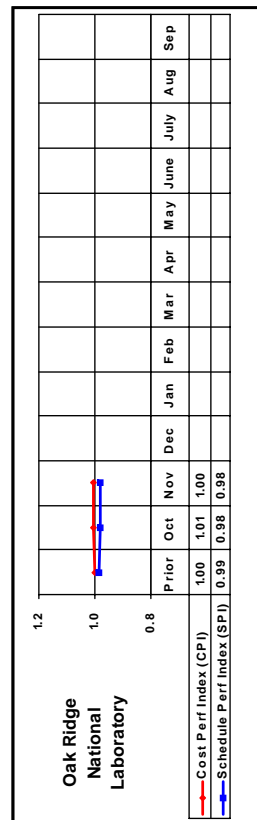
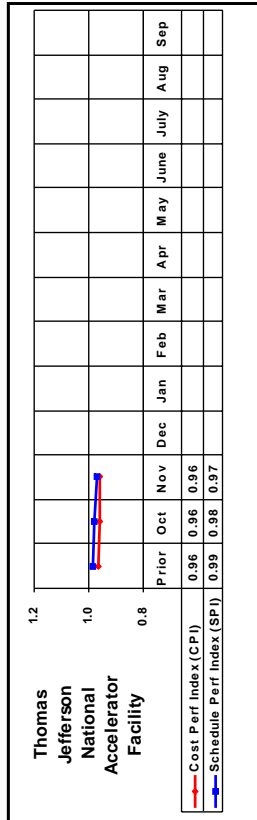
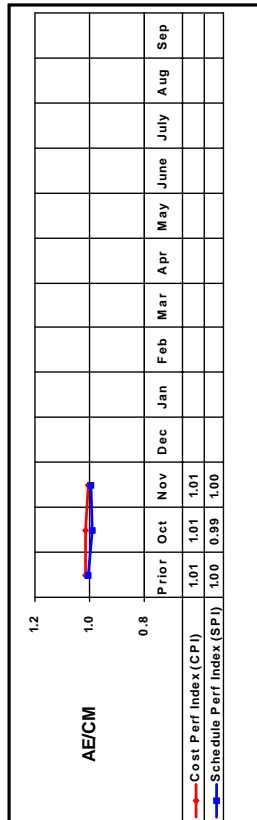
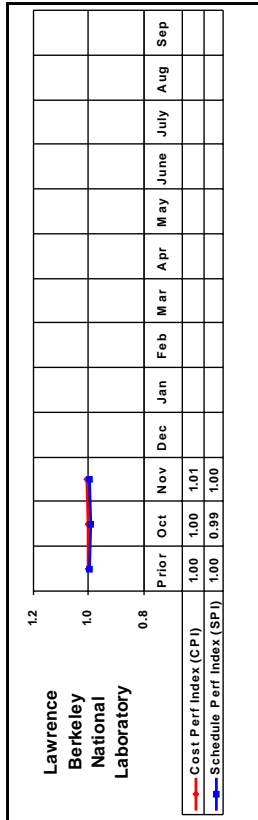
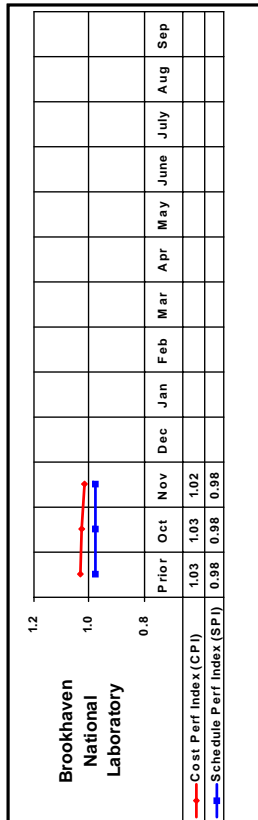
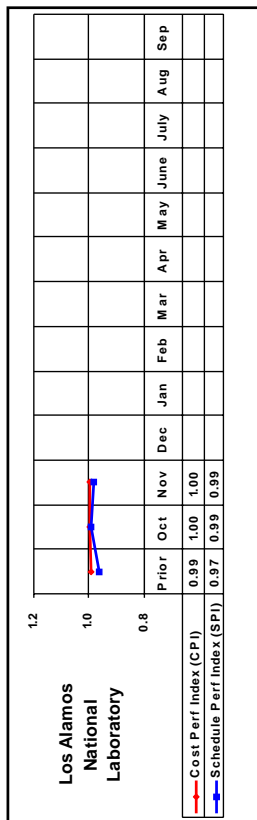
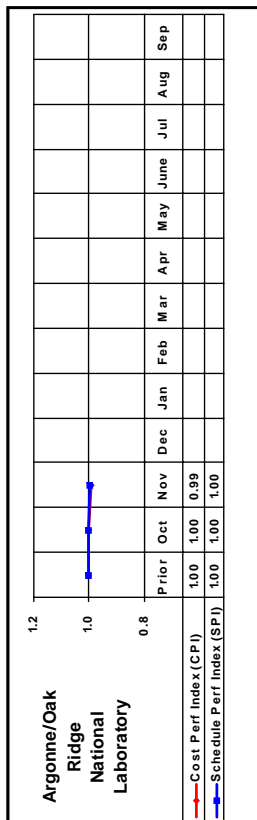
Description	Milestone Date	Forecast Date
EIS ROD	Jun-99	Jun-99 ✓
PSAR Issued for Approval	Dec-99	Dec-99 ✓
Submit PSAR to DOE for Approval	Dec-99	Dec-99 ✓
PSAD issued for Information	Sep-00	Sep-00 ✓
Issue FSAD for approval (Front End and Linac)	Sep-02	Aug-02 ✓
Issue FSAD for approval (Ring and Transfer Lines)	Jun-05	Apr-05
FSAR Issued for Approval	Aug-05	Jun-05
Complete Physical Construction and Project Acceptance Test	Jun-06	Mar-06

CLO

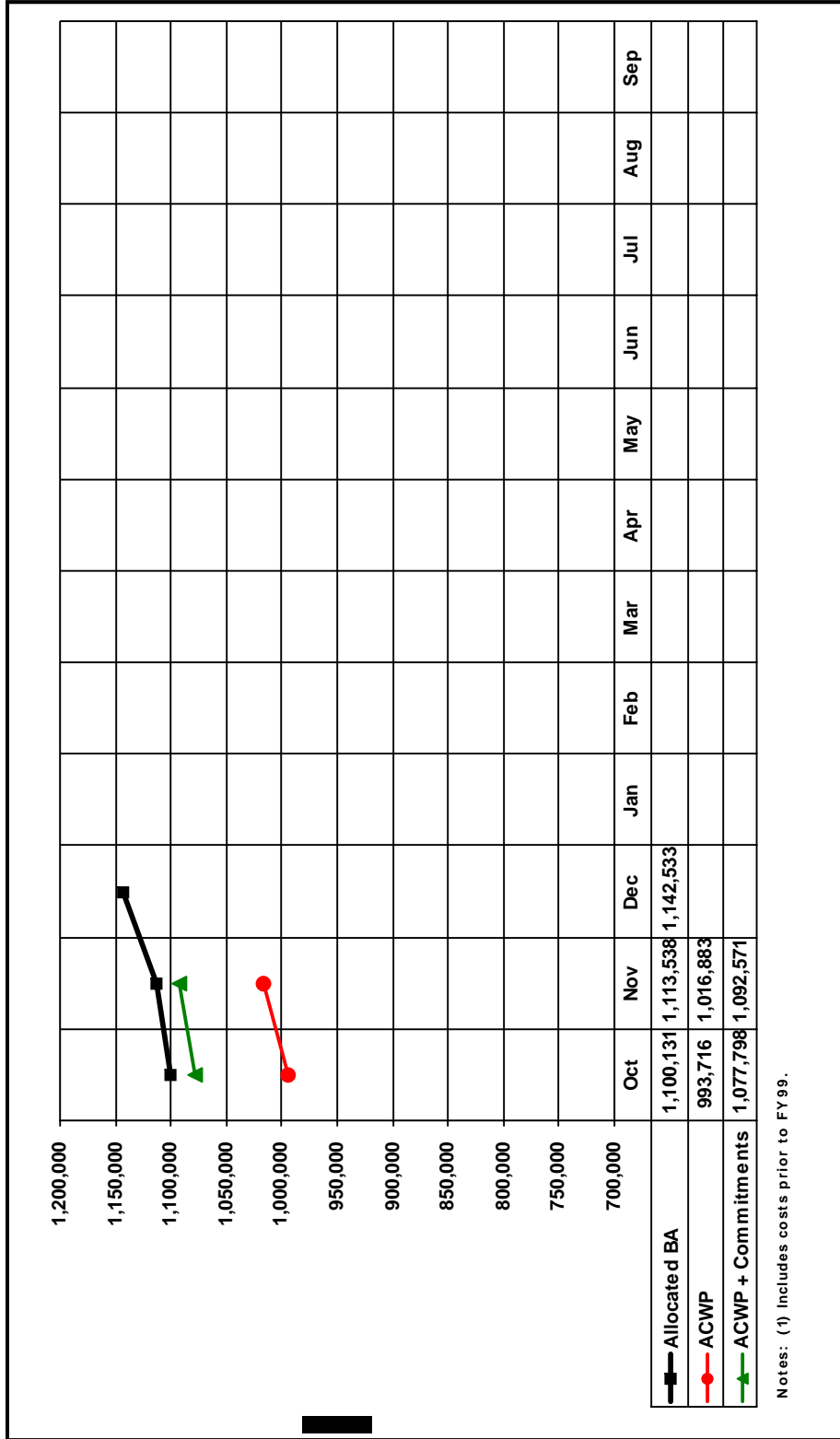




# Overall Project Performance is stable



Obligation Profile against BA



Phase funded procurements at the end of November could obligate an additional \$60.4 M, raising the total obligation potential to \$1,153M





PROJECT TITLE:	REPORTING PERIOD:										PROJECT NUMBER:				
	November 01, 2003 through November 30, 2003										99-E-334				
	BCWS PLAN DATE: November 2003										START DATE: October 1998				
PARTICIPANT NAME AND ADDRESS: Oak Ridge National Laboratory Oak Ridge, TN										COMPLETION DATE: June 2006					
ITEM	CURRENT PERIOD						CUMULATIVE TO DATE						AT COMPLETION		
	BUDGETED COST		ACTUAL COST		VARIANCE		BUDGETED COST		ACTUAL COST		VARIANCE		BUDGET (BAC)	ESTIMATE (EAC)	VARIANCE
	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	SCHED	COST	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	SCHED	COST			
1.02 Project Support	735.3	735.3	665.4	0.0	0.0	68.9	60,593.1	60,593.1	59,641.1	0.0	0.0	952.0	75,603	75,863	-260
1.03 Front End Systems	0.0	0.0	34.6	0.0	0.0	(34.6)	20,832.0	20,832.0	20,832.0	0.0	0.0	(1.2)	20,832	20,832	0
1.04 Linac Systems	6,183.7	3,697.3	4,257.6	(2,486.4)	(560.3)	268,487.9	262,667.1	266,528.0	266,528.0	(5,820.8)	(3,860.9)		313,216	315,851	-2,635
1.05 Ring & Transfer System	1,250.8	1,094.4	2,565.6	(156.4)	(1,474.2)	106,805.5	105,355.2	104,143.3	104,143.3	(1,450.3)	1,211.9		141,241	142,136	-895
1.06 Target Systems	2,402.1	2,823.7	2,028.4	421.5	795.2	72,648.0	68,431.0	67,062.2	67,062.2	(4,217.0)	1,378.7		106,528	108,108	-1,580
1.07 Instrument Systems	610.7	756.9	929.3	146.2	(172.4)	32,668.1	32,503.2	32,602.8	32,602.8	(164.9)	(99.6)		63,321	63,321	0
1.08 Conventional Facilities	7,061.9	8,036.7	10,011.7	974.8	(1,975.0)	298,747.9	297,260.6	295,315.6	295,315.6	(1,487.3)	1,945.0		367,540	376,981	-9,441
1.09 Integrated Control Systems	1,062.2	1,041.0	895.5	(21.2)	144.5	37,818.4	37,003.7	36,736.0	36,736.0	(814.7)	267.7		59,632	59,632	0
<b>LINE ITEM SUBTOTAL</b>	<b>19,306.7</b>	<b>18,185.3</b>	<b>21,393.1</b>	<b>(1,121.5)</b>	<b>(3,207.9)</b>	<b>898,600.9</b>	<b>884,645.9</b>	<b>882,852.2</b>	<b>882,852.2</b>	<b>(13,955.0)</b>	<b>1,793.6</b>		<b>1,147,913</b>	<b>1,162,724</b>	<b>-14,811</b>
<b>CONTINGENCY</b>													<b>44,787</b>	<b>29,976</b>	<b>14,811</b>
<b>TOTAL LINE ITEM</b>	<b>19,306.7</b>	<b>18,185.3</b>	<b>21,393.1</b>	<b>(1,121.5)</b>	<b>(3,207.9)</b>	<b>898,600.9</b>	<b>884,645.9</b>	<b>882,852.2</b>	<b>882,852.2</b>	<b>(13,955.0)</b>	<b>1,793.6</b>		<b>1,192,700</b>	<b>1,192,700</b>	<b>0</b>
1.01 Research & Development	96.8	96.5	188.4	(0.4)	(91.9)	98,542.3	98,530.1	98,715.9	98,715.9	(12.2)	(185.8)		101,874	101,874	0
1.10 Operations	1,197.7	1,186.0	1,585.5	(11.7)	(399.6)	36,353.1	35,911.4	35,314.8	35,314.8	(441.8)	596.6		117,126	117,126	0
<b>OTHER PROJECT COSTS SUBTOTAL</b>	<b>1,294.5</b>	<b>1,282.5</b>	<b>1,773.9</b>	<b>(12.1)</b>	<b>(491.5)</b>	<b>134,895.4</b>	<b>134,441.5</b>	<b>134,030.7</b>	<b>134,030.7</b>	<b>(454.0)</b>	<b>410.8</b>		<b>219,000</b>	<b>219,000</b>	<b>0</b>
<b>TOTAL PROJECT COST</b>	<b>20,601.2</b>	<b>19,467.8</b>	<b>23,167.0</b>	<b>(1,133.6)</b>	<b>(3,699.4)</b>	<b>1,033,496.3</b>	<b>1,019,087.4</b>	<b>1,016,882.9</b>	<b>1,016,882.9</b>	<b>(14,409.0)</b>	<b>2,204.4</b>		<b>1,411,700</b>	<b>1,411,700</b>	<b>0</b>
<b>RECONCILIATION TO CONTRACT BUDGET BASE</b>															
<b>DOLLARS EXPRESSED IN: Thousands</b>										<b>DATE: December 19, 2003</b>					



PROJECT TITLE:	REPORTING PERIOD:												PROJECT NUMBER:		
	November 01, 2003 through November 30, 2003												99-E-334		
	BCWS PLAN DATE: November 2003												START DATE: October 1998		
PARTICIPANT NAME AND ADDRESS:												COMPLETION DATE: June 2006			
Oak Ridge National Laboratory Oak Ridge, TN															
ITEM	CURRENT PERIOD						CUMULATIVE TO DATE						AT COMPLETION		
	BUDGETED COST		ACTUAL COST		VARIANCE		BUDGETED COST		ACTUAL COST		VARIANCE		BUDGET	ESTIMATE (EAC)	VARIANCE
	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	SCHED	COST	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	SCHED	COST			
AE/CM	7,061.9	8,036.7	10,011.7	974.8	-1,975.0	297,260.6	298,747.9	13,391.2	13,503.1	-1,487.3	1,945.0	367,540	376,981	(9,441)	
Argonne National Laboratory / ORNL	96.8	96.5	188.4	-0.4	-91.9	13,391.2	13,403.2	13,391.2	13,503.1	-12.0	-111.9	16,735	16,735	0	
Brookhaven National Laboratory	1,002.4	1,046.4	2,132.0	44.1	-1,085.6	103,333.1	105,596.7	103,333.1	101,597.1	-2,263.6	1,736.0	128,710	129,205	(495)	
Thomas Jefferson Laboratory	1,085.7	469.8	605.7	-615.9	-135.9	59,218.0	60,983.0	59,218.0	61,653.1	-1,765.0	-2,435.1	66,044	67,294	(1,250)	
Los Alamos National Laboratory	3,746.1	2,086.7	1,606.9	-1,659.4	479.8	178,343.2	181,043.0	178,343.2	178,462.0	-2,699.8	-118.8	198,088	199,243	(1,155)	
Lawrence Berkeley National Laboratory	66.4	105.4	48.9	39.0	56.5	28,282.4	28,397.0	28,282.4	28,130.0	-114.5	152.4	29,663	29,663	0	
Oak Ridge National Laboratory	7,542.0	7,626.2	8,573.4	84.2	-947.2	339,258.8	345,325.5	339,258.8	338,222.0	-6,066.7	1,036.8	560,132	562,602	(2,470)	
<b>WBS SUBTOTAL</b>	20,601.2	19,467.7	23,167.0	(1,133.5)	(3,699.3)	1,019,087.3	1,033,496.2	1,019,087.3	1,016,882.9	(14,409.0)	2,204.4	1,366,913	1,381,724	(14,811)	
<b>CONTINGENCY</b>												44,787	29,976	14,811	
<b>TOTAL PROJECT COST</b>	20,601.2	19,467.7	23,167.0	(1,133.5)	(3,699.3)	1,019,087.3	1,033,496.2	1,019,087.3	1,016,882.9	(14,409.0)	2,204.4	1,411,700	1,411,700	0	
<b>RECONCILIATION TO CONTRACT BUDGET BASE</b>															
<b>DOLLARS EXPRESSED IN: Thousands</b>												<b>DATE: December 19, 2003</b>			



PROJECT TITLE:	REPORTING PERIOD:		PROJECT NUMBER:													
	November 01, 2003 through November 30, 2003		99-E-334													
PARTICIPANT NAME AND ADDRESS:	BCWS PLAN DATE:		START DATE:													
	November 2003		October 1998													
Oak Ridge National Laboratory Oak Ridge, TN		COMPLETION DATE:		June 2006												
BUDGETED COST FOR WORK SCHEDULED (NON - CUMULATIVE)																
ITEM	BCWS CUM TO DATE	FISCAL YEAR												FY Total	Out Years	Budget at Completion
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep			
<b>PM BASELINE (BEGINNING OF PERIOD)</b>	862,169	23,755	18,636	18,917	22,523	16,673	18,819	16,123	12,437	19,449	11,524	12,393	10,890	202,139	83,605	1,147,913
1.02 Project Support	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.03 Front End Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.04 Linac Systems	-	12	(7)	31	40	52	12	(21)	(30)	(15)	(37)	(48)	(27)	(30)	34	4
1.05 Ring & Transfer System	-	(7)	(8)	(8)	(10)	(10)	(12)	(9)	(9)	(11)	(14)	(21)	139	30	(34)	(4)
1.06 Target Systems	-	(209)	(52)	(52)	28	(131)	(108)	(170)	472	170	-	-	(27)	(27)	27	-
1.07 Instrument Systems	-	(479)	(119)	(119)	32	(5)	(159)	(54)	246	(321)	(254)	(323)	398	(1,039)	1,039	-
1.08 Conventional Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.09 Integrated Control Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>TOTAL AUTHORIZED CHANGES</b>	-	(682)	(148)	(148)	93	(94)	(266)	(254)	679	(178)	(306)	(392)	483	(1,066)	1,066	0
<b>PM BASELINE (END OF PERIOD)</b>	862,169	23,755	17,953	18,769	22,616	16,579	18,553	15,868	13,117	19,271	11,218	12,001	11,373	201,073	84,670	1,147,913
RECONCILIATION TO CONTRACT BUDGET BASE																
<b>DOLLARS EXPRESSED IN: Thousands</b>		<b>DATE: December 19, 2003</b>														

Project Change Requests implemented in November are as follows:

Revision	PCR Number	Description	Impact (Cost/Sched/Tech)	PCR Cost Impact (\$K)
R457	TG-04-001	Property Load BCWS Procurement Activities	Sched	-
R458	SN-04-002	Parameter List Update	Tech	-
R459	AS-04-001	Adjust FTE Mix	Cost	-
R460	IS-04-002	Adjust BCWS on Procurement Activities	Sched	-



**Actual Cost of Work Performed (ACWP)**—Actual cost incurred as reported through laboratory cost accounting systems plus any accruals.

**Allocated Budget Authority (BA)**—Cumulative funds currently allocated and authorized by the Department of Energy that may be committed and spent by the contractor for project activities.

**Budget at Completion (BAC)** —The sum of all budgets allocated to the project excluding contingency

**Budget to Complete (BTC)** —The sum of all budgets allocated to the project less commitments and cumulative actual costs.

**Budgeted Cost of Work Performed (BCWP)**—Value of the planned scope of work physically accomplished.

**Budgeted Cost of Work Scheduled (BCWS)**—Cost plan based on the budgeted value of a scope of work, time-phased based on the schedule for the scope of work.

**Commitments**—Funds allocated to subcontractors where the work has been authorized but not yet expended.

**Cost Performance Index**—The ratio of the value of the work performed to actual cost;  $CPI = BCWP/ACWP$ . Values less than 1.0 represent “cost overrun” condition, and values greater than 1.0 represent “cost underrun” condition.

**Cost Variance (CV)**—Difference between the value of the physical work performed and the actual cost expended.  $CV = BCWP - ACWP$ . A negative result is unfavorable and indicates the potential for a cost overrun.

**Estimate at Completion (EAC)**—Forecast final cost of a scope of work based on the current ACWP plus a management assessment of the cost to complete the remaining scope of work.

**Estimate to Complete (ETC)**—A realistic appraisal of the cost to complete the remaining scope of work.

**Forecast Budget Authority**—Future time-phased plan of how the project expects remaining BA to be allocated to the project by DOE. Through the current reporting period Forecast BA will equal Allocated BA.

**Line Item (LI)**—Fund “type” for design, procurement, construction, fabrication, installation, and pre-operational testing of a capital facility.

**Obligation Plan**—Time-phased plan of how each laboratory plans to commit their Allocated BA. Labor and

materials and supplies are typically time-phased as expended, while procurements are typically time-phased at award of contract plus award of any contract options.

**Other Project Cost (OPC)**—Fund “types” (Operating Expense and Capital Equipment) supporting, but not directly contributing to a LI construction project, generally include research and development and pre-operation activities.

**Percent Complete**—The ratio of the Earned value to the Budget at Completion.  $\% \text{ Complete} = BCWP/BAC$

**Percent Contingency remaining**—The ratio of remaining contingency dollars to remaining work calculated as follows. The numerator is equal to the contingency available after consideration of the EAC. The denominator is the EAC less ACWP less commitments (excluding commitment to the AECM that has not been passed through to subcontractors) and outstanding phase funded procurements.

**Percent Planned**—The ratio of the current plan to the budget at completion.  $\% \text{ Planned} = BCWS/BAC$

**Schedule Performance Index**—The ratio of the value of the work performed to work scheduled;  $SPI = BCWP/BCWS$ . Values less than 1.0 represent “behind schedule” condition, and values greater than 1.0 represent “ahead of schedule” condition.

**Schedule Variance (SV)**—Difference between the value of the physical work performed and the value of the work planned (scheduled).  $SV = BCWP - BCWS$ . A negative result is unfavorable and indicates a behind schedule condition.

**Total Estimated Cost (TEC)**—The TEC represents the total capital funds authorized for the project including contingency funds.

**Total Project Cost (TPC)** — $TEC + OPC$