

# The Spallation Neutron Source Monthly Report

## February 2004



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





## CONTENTS

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PROJECT OVERVIEW AND ASSESSMENT	3
TECHNICAL AND PROGRAMMATIC PROGRESS	
WBS 1.4 Los Alamos Linac	5
WBS 1.4 Thomas Jefferson Linac	6
WBS 1.5 Ring and Transfer Systems	7
WBS 1.6 Target Systems	8
WBS 1.7 Instrument Systems	9
WBS 1.8 Conventional Facilities	10
WBS 1.9 Integrated Control Systems	11
WBS 1.3, 1.4, 1.5 Accelerator Systems Division	12
WBS 1.2 Project Support	13
COST/SCHEDULE PERFORMANCE REPORTS	15
GLOSSARY	20

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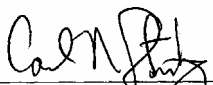


## Project Overview and Assessment



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

CCL Module 2 in Linac Tunnel

  
 Carl N. Strawbridge  
 SNS Deputy Project Director  
 4/06/04  
 Date

### Highlights and Issues:

- Good project performance continues with minor cumulative cost and schedule variances of 0.1% and 2% respectively against the March 2006 early finish schedule. Through the end of February, 78.3% of the project is complete. Completion percentages are:
  - ◊ 97 % of R&D
  - ◊ 94 % of design
  - ◊ 73 % of technical hardware (including procurement and fabrication)
  - ◊ 85 % of conventional construction
  - ◊ 49 % of installation
- Contingency continues to be tight. The available contingency bal-

- ance of \$40.7M will be reduced to \$25.5M once the changes identified in the Estimate at Completion are incorporated into the baseline. Approximately \$5M of undistributed pre-operations budget is also available.
- Excellent safety performance continues. Through 21 February, 2004, the total Project has worked in excess of 4.8 million hours with 60 recordable injuries (an increase of 6 from last month: 2 were reclassified, 4 were new) and no lost work day (away) cases.
- Management focus continues on the Target installation to ensure that the project schedule is not impacted by any delays and on the production schedule for the Superconducting Linac components at JLAB.
- Due to FY04 BA constraints, work priorities are being closely managed.

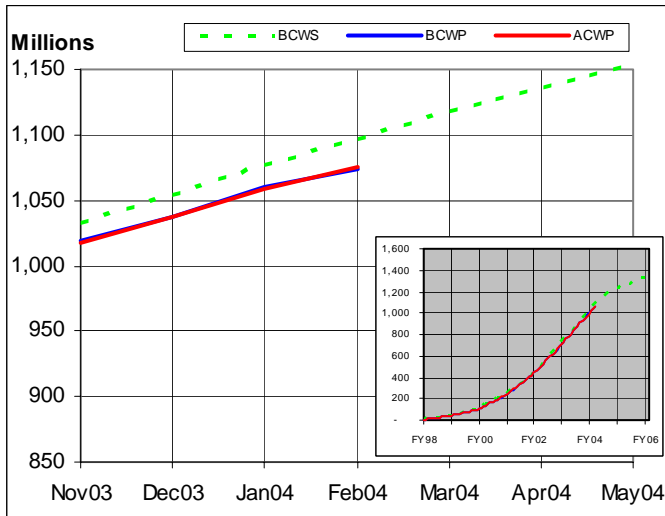
### Assessment:

**Accelerator Systems Division (ASD):** Drift Tube Linac (DTL) tanks 1-3 have been installed and easily conditioned to 25% over voltage at a 2% duty factor. All the drift tubes have been tested and installed in DTL tanks 4-6. A very successful run was completed on the ion source hot spare stand; 25 days (of the 33 day run) included operation at the full 6% duty cycle. Initially the average pulse current often exceeded 40 mA but decreased to roughly 35 mA after the cesiations became less effective. After successful debugging, the source often ran for several days without a single trip. The first Coupled Cavity Linac (CCL) module 1 has been assembled and tested. All 12 intersegment quads have been installed and one was powered to test the power supply. RF conditioning is scheduled to start the second week in April. CCL module 2 has been assembled and is ready for vacuum checking. Superconducting cavity processing has restarted and two high-beta cavities have exceeded their gradient requirement by 33% in vertical dewar test. All Ring arc quarter cells have been delivered to SNS and production has restarted on the remaining 8 (of 32) half cells. No major issues were identified during the Accelerator Systems Advisory Committee Review held during the second week of March and the Accelerator readiness review for DTL tanks 1-3 is going well. Closeout is scheduled for Thursday April 1.

**Experimental Systems Division (XFD):** XFD met a major milestone this month with the installation of the scattering tank for the backscattering spectrometer, marking the start of instruments systems equipment installation. The prototype sample changer for rapid changing of samples in cryogenic environments has been assembled and successfully tested at the HFIR cryo-lab. The project plan for the development of the 90 degree scintillator module for the Powder and Engineering Instruments has been completed and a prototype detector for the SANS instrument has been tested. This detector incorporates new technology not available when the SANS instrument was baselined and is less expensive and has a shorter lead time than the detector currently in the baseline. The rapid pace of Target installation activity continues. The final blocks that form the forward stack of shielding around and above

the target cart have been installed and the first of the 20 upper interstitial blocks have been received. The last six inner guide rails are being installed. The leak test fixture for the Proton Beam Window has been installed and has performed well in successfully verifying the large seal between the flight tube and the Proton Beam Window bellows. The vessel insert stud tensioning tool is ready for use during initial installation of the core vessel inserts. Procurement bids for the target module and the Hot Cell installation package are being reviewed.

**Conventional Facilities (CF):** Construction efforts are focused on the Target building and CLO. Double shifts are operating in both buildings to ensure that installation of the target equipment in the Hot Cell can begin April 12th and permit the June 2004 move into the CLO. The installation of the stainless steel liner in the west bay of the hot cell has begun and the installer is currently working on the floor pan and the walls. The final supports for the cell crane rail were grouted in position and the 35 ton hot cell shielded inner door is being fabricated at the vendor. During this fabrication process, a crack has developed in the shaft of the upper rotating door. The cause of the failure is under investigation. Replacement of the shaft could result in an 8-10 week delay in delivering the door to the site. Mechanical and electrical work is ongoing throughout the CLO building. The foundation for the CLO to Target bridge has been installed and erection of the bridge steel will begin shortly. The steel canopy modifications are nearly complete, the curtain wall is nearly complete and the building is mostly dried in. Based on detailed analysis, a decision has been made on the issue of RTBT tunnel settlement. It has been determined that future settlement of the tunnel will be within acceptable range for successful accelerator operation as well as for the structural integrity of the tunnel itself. In order to validate this analysis, four soil borings will be performed to better quantify the soil under the tunnel. This information will provide fundamental design data for installation of grout columns under the tunnel should the need arise. Backfilling over the tunnel will be allowed to proceed while the settlement is closely monitored.



Total Project	Feb04	Cum-to-Date
BCWS	19,101	1,096,282
BCWP	14,470	1,074,024
ACWP	17,126	1,075,353
CV	-2,656	-1,329
SV	-4,631	-22,258
CPI	0.84	1.00
SPI	0.76	0.98
<b>Budget at Complete</b>		1,370,980
<b>Contingency</b>		40,720
<b>Total Project Cost</b>		1,411,700

<b>Total Project Cost (TPC)</b>	<b>\$1,411.7 M</b>
Percent planned (cumulative)	80%
Percent complete (cumulative)	78.3%
<b>Total Estimated Cost (TEC)</b>	<b>\$1,192.7 M</b>
Cost and Commitments through 2/29/04	\$990M
Outstanding Phase Funded Awards	\$43.4M
Budget to Complete	\$162.0M
Contingency	\$40.7M
Estimate at Completion	\$ 1,167.2M
Remaining Contingency Based on EAC (~19%)	\$ 25.5M

**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 longest path resides in Target System's Hot Cell installation sequence. A delay in the installation of the Target Hot Cell liner has resulted in a small amount (12 days) of negative float in the integrated working schedule. This schedule is being monitored closely to ensure that there are no delays in the loading of Target Mercury, conducting integrated startup testing of the Target systems and the Target Readiness assessment. Target Systems installation effort has been grouped into "installation packages" that are being performed by the General Construction Contractor. The package involving installation of the Hot Cell equipment is currently being negotiated and SNS personnel are currently working with the General Contractor in an effort to capitalize on all opportunities for double shifts and parallel sequencing of activities.

**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



CCL modules 2 (right) and 3 (left) at the vendor

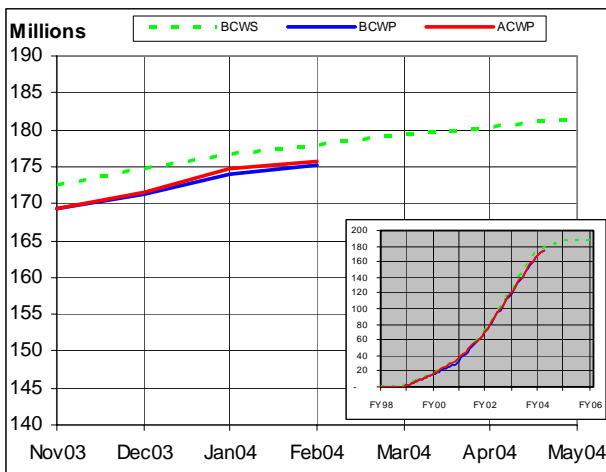
**Highlights:**

- The second 5-MW CCL klystron was acceptance tested and shipped to ORNL.
- Two CCL RF windows were acceptance tested and shipped to ORNL.
- The final DTL drift tube was repaired and shipped to ORNL.
- CCL Module 2 was completed, tuned, and shipped to ORNL.
- All wire-scanner electronics were completed and shipped to ORNL.

**Assessment/ Issues:**

Key issues being worked at this time are the CCL #4 module delivery schedule and the backlog inventory of two Thales 5-MW CCL klystrons and seven Thales 550-kW SCL klystrons that need site acceptance tests at LANL.

**Performance and Milestones:**



	Feb04	Cum-to-Date
BCWS	1,366	178,001
BCWP	1,115	175,203
ACWP	1,009	175,669
CV	106	-466
SV	-251	-2,798
<b>CPI</b>		
CPI	1.11	1.00
<b>SPI</b>		
SPI	0.82	0.98
<b>Budget at Complete</b>		186,125
<b>Planned % Complete</b>		95.6%
<b>Actual % Complete</b>		94.1%

**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 and CCL cavities.  
*Corrective Action:* Continued vendor liaison will be performed to ensure the schedule and quality of deliverables is maintained. Currently there is no impact on the project's early finish date.

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



**Highlights:**

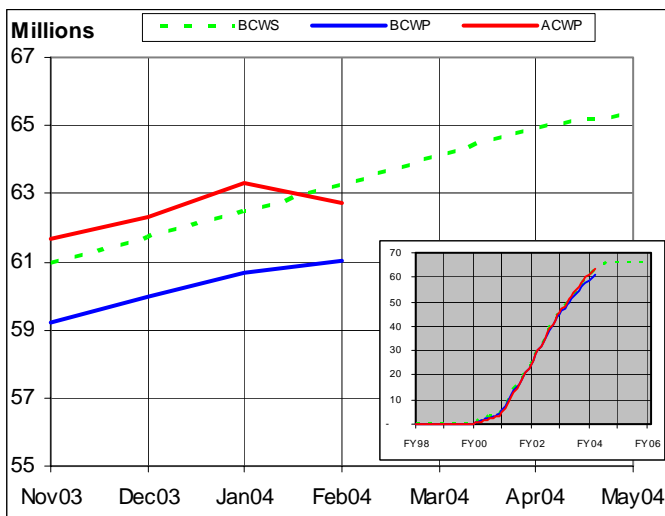
- One additional High-β cavity was qualified in February.
- String Assembly for cryomodule M-11 was completed.
- Assembly of cryomodules M-9 and M-10 continued.
- Testing of Cryomodule M-8 was started.

Testing of cryomodule M-9

**Assessment/ Issues:**

- The cavity qualification process has been impeded by continuing problems with the High Pressure Rinse pump(s). Considerable effort continues to be devoted to determining the cause and developing solutions or corrective actions which will solve this problem. It is now believed that grease is being introduced into the HPR system by the pump. Efforts are underway to completely clean the system.
- Failure of the RF system power supply system resulted in a delay in testing of Cryomodule M-8. The system is expected to be operational in April after new resistors are installed.

**Performance and Milestones:**



	Feb04	Cum-to-Date
<b>BCWS</b>	778	63,283
<b>BCWP</b>	368	61,039
<b>ACWP</b>	-596	62,715
<b>CV</b>	964	-1,676
<b>SV</b>	-409	-2,244
<b>CPI</b>		
	-0.62	0.97
<b>SPI</b>		
	0.47	0.96
<b>Budget at Complete</b>		
		66,044
<b>Planned % Complete</b>		
		95.8%
<b>Actual % Complete</b>		
		92.4%

**Cost Performance:**

*Cause and Impact:* The cumulative cost variance is a result of the additional effort required in the Medium Beta cavity qualification. The current period cost variance is due to a cost correction for infrastructure activities at JLAB.

*Corrective Action:* An ETC will be implemented in March 2004 and appropriate changes will be incorporated into the baseline.

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

**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.



Doublet magnet assembly

**Highlights:**

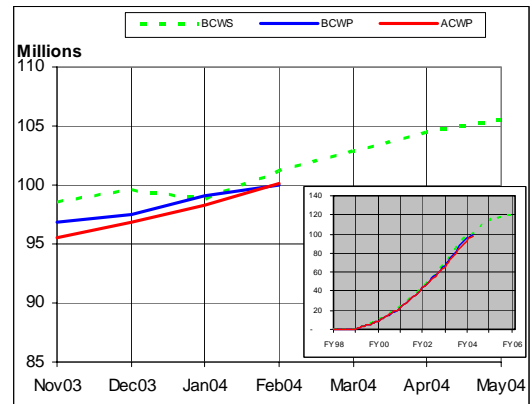
- A Diagnostics Advisory Committee (DAC) review was conducted at BNL. The committee noted several shortcomings. A ring diagnostics production task force team was formed and a prioritized set of deliverables and milestones have been established.
- Tests of the beam-current-monitor electronics boards continue. The six-week test at the AGS A10 house with switching power supply noise was successfully completed. Further tests were conducted on the BCM electronics, again without failures and a new round of "torture tests" will inject a high level of RF noise to the power supply of these boards to test their sustainability under extreme conditions.
- The contract dispute between the vendor and BNL regarding the cost of the 21-cm ID quadrupole magnets has been settled and a delivery schedule for the last eight 21Q40 quadrupoles has been agreed upon.
- Two critical magnets in the ring injection stripping-foil region (chicane magnet #2 and #3) were mounted on a common stand for an integrated measurement of the magnetic fields. Long-coil integrated measurement successfully confirmed the designed compensation of skew-quadrupole component. Further point-coil measurement is planned to confirm the angle of magnetic field guiding the stripped electrons.
- A total of 24 (out of 32) ring dipole-quad-corrector ("half-cell") assemblies and the first (out of 4) ring "quarter-cell" assembly have been delivered to ORNL.

**Assessment/Issues:**

Work on the "BNL/ORNL" transition continues at all levels of lab management.

**Performance and Milestones:**

	Feb04	Cum-to-Date
BCWS	2,369	101,146
BCWP	925	100,059
ACWP	1,827	100,136
CV	-902	-77
SV	-1,444	-1,087
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CPI	0.51	1.00
SPI	0.39	0.99
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Budget at Complete		118,504
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Planned % Complete		85.4%
Actual % Complete		84.4%



**Cost Performance :**

*Cause and Impact:* The current period cost variance is the result of a correction to earned value reported in prior periods as well as in incorporation of a PCR that accelerated the BCWS for the Extraction Kicker power supplies to the current month. This aligned cumulative values but caused an incremental spike.

*Corrective Action:* Remaining work is being assessed and the remaining work will be quantified at a higher level of detail that will reduce the risk of BCWP overstatement in the future.

**Schedule Performance :**

*Cause and Impact:* The current period schedule variance is largely due to the PCR mentioned above. The cumulative schedule variance is due delays in the arc half cell assembly and the high field magnet deliveries.

*Corrective Action:* None required. Both will be nearly complete by the end of June. These delays do not impact ASD's installation plans.

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





## Target Systems– Oak Ridge National Lab



Target monolith showing shielding blocks and inner guide rails

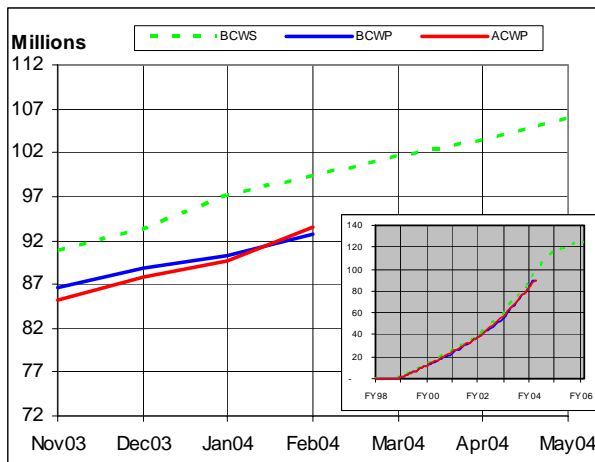
### Highlights:

- Installation continues to progress. In February, the core vessel chimney shield rings, the remaining vessel vertical supply and return pipes as well as the lower interstitial shield blocks were installed. Additionally, twelve of eighteen inner guide rails for the shutter system were installed.
- The hot cell servomanipulator system successfully completed factory acceptance testing at the vendor. The inner reflector plug drawings were reviewed with the vendor and a number of changes aimed at reducing the fabrication complexity and time have been proposed based on this review.
- Fabrication is complete on the portion of the target carriage rail system that will be installed in the tunnel between the core vessel and hot cell.
- Contracts for the Ring Injection Dump beam stop and vacuum window as well as the cryogenic hydrogen system have been awarded and bids for the manufacture of the mercury target module have been received and are being evaluated.

### Assessment/ Issues:

The installation schedule continues to be monitored closely. SNS is working with the contractor to ensure that parallel activities and/or double shifts are utilized where practical to reduce the total duration.

### Performance and Milestones:



	Feb04	Cum-to-Date
BCWS	2,164	99,357
BCWP	2,522	92,716
ACWP	3,877	93,583
CV	-1,355	-867
SV	358	-6,641
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CPI	0.65	0.99
SPI	1.17	0.93
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<b>Budget at Complete</b>		124,682
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<b>Planned % Complete</b>		79.7%
<b>Actual % Complete</b>		74.4%

### Cost Performance:

*Cause and Impact:* The current period cost variance is due to the processing of a large number of accruals that corrected the positive cost variance that had been previously reported. The cumulative variance is due to contracts that have costed at a value greater than that in the baseline.

*Corrective Action:* See below corrective action.

### Schedule Performance:

*Cause and Impact:* The schedule variance is caused by a number of cases in which the baseline does not reflect contracted performance/delivery milestones agreed upon in the procurement contract as well as by “true” late activities in which the baseline correctly represents the original plan but the work being accomplished is behind schedule.

*Corrective Action:* A PCR will be performed that updates the baseline to the current information, both in terms of cost and schedule. At this time, none of these delays impact the critical path defined by the Hot Cell installation sequence.

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





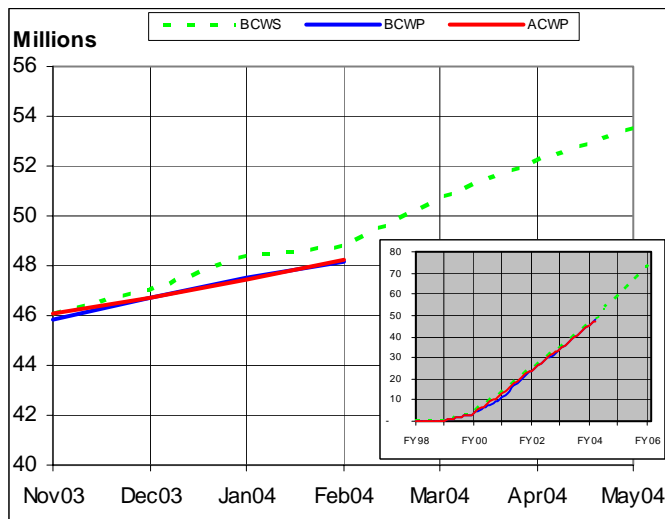
Assembled Backscattering Chamber

**Highlights:**

- The Astrium choppers for the Backscattering spectrometer have passed the acceptance testing and will be installed into the IPNS GPPD instrument.
- The final version first article of the Astrium bandwidth chopper support for SNS installation is being fabricated and will undergo testing as soon as the fabrication is completed.
- Plans for testing of the FERNS Prototype Sample Changer at HFIR were completed.
- The data analysis software team leader position has been filled and the first Instrument Systems Scientific Associate has started work.
- The scattering chamber for backscattering spectrometer was shipped to ORNL, in time for installation before the end of March.

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

**Performance and Milestones:**



	Feb04	Cum-to-Date
<b>BCWS</b>	430	48,821
<b>BCWP</b>	594	48,133
<b>ACWP</b>	783	48,249
<b>CV</b>	-189	-116
<b>SV</b>	164	-688
<b>CPI</b>	0.76	1.00
<b>SPI</b>	1.38	0.99
<b>Budget at Complete</b>		80,036
<b>Planned % Complete</b>		61.0%
<b>Actual % Complete</b>		60.1%

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

**Cost Performance:**

*Cause and Impact:* The current period cost variance is due to the fact that actual costs for a neutron guide were incurred but the earned value was not taken on that activity.

*Corrective Action:* Earned value on that activity will be taken in March.

**Schedule Performance:**

*Cause and Impact:* None required

*Corrective Action:* None required



Target Hot Cell wall

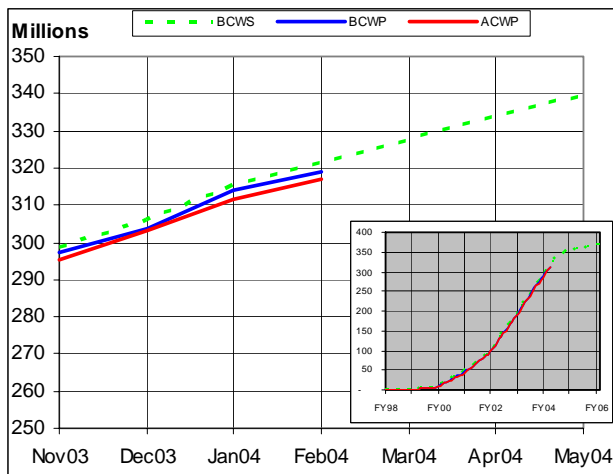
**Highlights:**

- Construction of the East and West Makeup Air Buildings and Ring Injection Dump continued.
- The patch and rub on Hot Cell interior walls has been completed in the Target Building. Work continues on the Service Gallery walls around Hot Cell. The inner Target cart liner and the core vessel chimney have been installed and welded.
- Work is also proceeding on the foundation and walls for Compressor Building as well as installation of fire protection sprinkler system piping, general piping systems, electrical systems, building siding, windows and roofing.
- The installation of the pedestrian bridge is underway and walls have been completed at the loading dock area and for the CLO. Also, drywall installation, mechanical and electrical installation and installation of siding and windows continues.
- Testing and labeling of fiber optic cable and installation of the fiber optic backbone in the Ring Service Building and Booster Pump has been completed
- Installation of the Fire Alarm System in the CLO Building continues.

**Assessment/ Issues:**

The critical milestones allowing start of Hot Cell installation in April 2004 and occupancy of the CLO in June 2004 are being closely monitored at all levels within the project.

**Performance and Milestones:**



	Feb04	Cum-to-Date
<b>BCWS</b>	6,188	321,623
<b>BCWP</b>	5,057	318,889
<b>ACWP</b>	5,418	316,827
<b>CV</b>	-360	2,062
<b>SV</b>	-1,131	-2,734
<b>CPI</b>		
	0.93	1.01
<b>SPI</b>		
	0.82	0.99
<b>Budget at Complete</b>		370,152
<b>Planned % Complete</b>		86.9%
<b>Actual % Complete</b>		86.2%

**Cost Performance:**

*Cause and Impact:* The cumulative positive cost variance is largely due to contractual issues with the structural steel. This amount is partially offset by a negative cost variance in the site support area due to increased costs in that area.

*Corrective Action:* A PCR is being processed to address the site support expenses and the contractual issues with the steel are being worked.

**Schedule Performance:**

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

*Corrective Action:* Efforts are being accelerated to ensure the feasibility of the Project's move to the CLO in June.

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



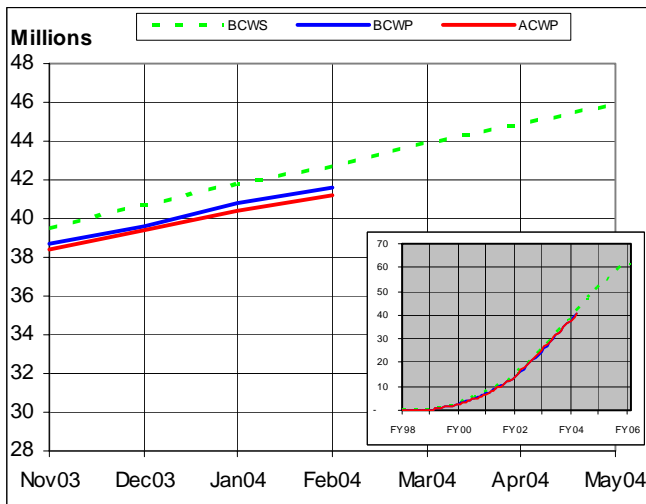
4.5K Cold Box Integrated Control System

**Highlights:**

- Installation and checkout of the ICS for the CHL main 4.5 K cold box is well underway. Calibration of the ~ 250 devices and checkout of system inputs and outputs is more than 90% complete. Verification of control loop and interlock operation is 30% complete.
- In preparation for the upcoming ARR, Test Plans were submitted for the Timing System Master and for general “IOC Operations.” The MPS Test Plan was completed and the detailed signal list is being completed. The controls portions of the Vacuum, RCCS and RF test plans were also updated. The team began weekly reviews of a subsystem “scorecard” leading up to the DTL 1-3 run.
- Work continued on the 3-step conversion of all IOCs. By the end of February, all but two were at EPICS v3.13.9, about half were fully compliant with the standard Application Development Environment (ADE). A few had completed the process and were at EPICS v3.14.4. The technical details of interlocks between Ring Vacuum controls and MPS, Ring Injection Dump systems, and Target systems have been defined and the Ring Vacuum Controls FSD was updated. Ring Injection Dump control software has been completed and will be factory tested on March 1<sup>st</sup>.
- The Oxygen Deficiency Hazard (ODH) system for the CHL is complete except for the installation of a phone dialer and signals to an external unit that will be used to notify the Lab Shift Superintendent of an ODH alarm. As-built drawings have been approved.
- An external design review of the Target PPS is scheduled for March 3. A new cost estimate has been completed for procurement and construction labor costs based on the current design.
- Delivery of the last three Chipmunks is on-schedule for mid-March delivery. This will bring the total inventory up to 30 units. The last ten will arrive in May.
- The WBS 1.9 budget was adjusted to accommodate an expected BA allocation of \$10.2M in FY04. The revised scope has been agreed upon by all partner laboratories and the project’s baseline will be revised in March.

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

**Performance and Milestones:**



	Feb04	Cum-to-Date
BCWS	904	42,743
BCWP	719	41,552
ACWP	867	41,219
CV	-148	333
SV	-185	-1,191
<b>CPI</b>		
	0.83	1.01
<b>SPI</b>		
	0.80	0.97
<b>Budget at Complete</b>		
		61,337
<b>Planned % Complete</b>		
		69.7%
<b>Actual % Complete</b>		
		67.7%

**Cost Performance:**

*Cause and Impact:* The cost variance is largely due to efficiencies in the Ring controls area.

*Corrective Action:* The entire controls plan is under review and a PCR will be implemented that adjusts all profiles to be consistent with the allocated budget.

**Schedule Performance:**

*Cause and Impact:* The schedule variance is largely due to deliberately delayed procurement activities in the Ring controls area.

*Corrective Action:* The entire controls plan is under review and a PCR will be implemented that adjusts all profiles to be consistent with the allocated budget.

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



Klystron Building installation

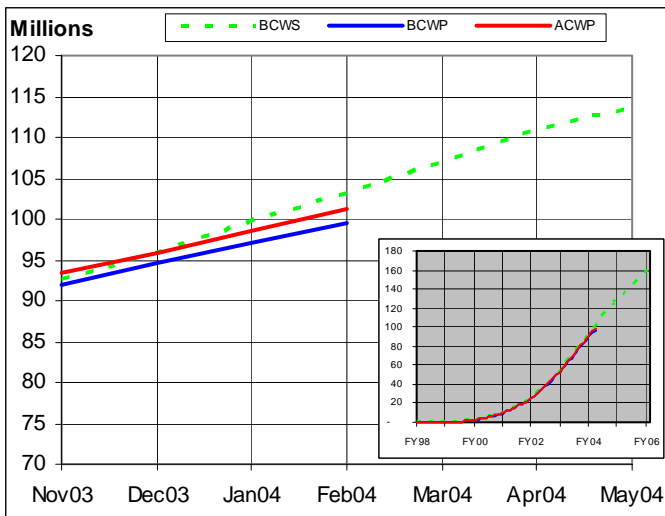
**Highlights:**

- Efforts were focused on preparing for the Accelerator Readiness Review at the end of March. This included ensuring DTL’s 1-3 were completely ready and that the RF systems to support these components were operational.
- The final-machined post couplers are the only mechanical components remaining for DTL-4. Tuning of DTL-5 has begun and by the end of February, only one drift tube for DTL-6 had not been delivered to ORNL.
- CCL-2 components were received at the SNS site in February. The vendor inspected the components after unloading and all components appeared satisfactory. The support frames have been set on the beam line and leveled and segment installation began.
- The Thales 5MW tube for CCL-1 has been tested at both LANL and ORNL and is presently operating at 4.0MW at 20Hz with 1.0ms pulses. CCL-1 requires 3.1MW; the tube has more than enough headroom. Both the High Power and Low Power RF systems for CCL-1 are ready for operation.
- Testing of the two cold box compressors damaged in shipment has indicated that the bearings were not damaged.

**Assessment/ Issues:**

All deliveries that could affect the commissioning schedule are being monitored closely.

**Performance and Milestones:**



	Feb04	Cum-to-Date
BCWS	3,550	103,228
BCWP	2,492	99,445
ACWP	2,754	101,254
CV	-262	-1,809
SV	-1,059	-3,783
<b>CPI</b>		
	0.90	0.98
<b>SPI</b>		
	0.70	0.96
<b>Budget at Complete</b>		
		170,243
<b>Planned % Complete</b>		
		60.6%
<b>Actual % Complete</b>		
		58.4%

**Cost Performance:**

*Cause and Impact:* The cumulative cost variance is due to klystron replumbing, DTL recovery, transfer line leaks, cryomodule production issues, CHL compressor skids manufacturing problems and HEBT dipole stands relocation and regrouping.

*Corrective Action:* An ETC is currently underway and some offsets have already been identified.

**Schedule Performance:**

*Cause and Impact:* The cumulative schedule variance is largely due to late deliveries of klystron spares, CCL deliveries and water systems. Cryomodules are also running approximately 1 month behind plan.

*Corrective Action:* A series of ETC’s will be incorporated over the next few months that will bring the baseline up to date.

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





CLO Atrium entry

**Highlights:**

- Additional erosion controls were implemented on the site incorporating the neighboring CNMS construction effort.
- A Focus Safety Luncheon was established to focus on apprentices and newer employees who have been shown to be more likely to be injured or involved in an incident. Particular emphasis was placed on the Job Safety Analysis (JSA), and the importance of analyzing all hazards in the JSA.
- The Unreviewed Safety Issue Determination for commissioning DTL Tanks 1-3 has been completed. Since this particular commissioning effort was not specifically addressed in the Safety Assessment Document (SAD), this sequence had be addressed separately. It was determined that this activity is well within the already approved Accelerator Safety Envelope, that the safety systems in place will provide proper protection to staff and that this activity can proceed.
- Discussions with the ORNL Waste Management staff were held regarding materials in the CHL facility.
- Measurement and analysis of ASD hardware is being performed at the SNS Metrology Lab and XFD vendor surveillance activities continue. Calibration Coordinators from both ASD and XFD are performing inspections within their groups to determine their needs for equipment calibration services. Listings are currently being submitted to the SNS Project Office QA Manager. A similar process is also underway to capture the Project’s maintenance and inspection requirements associated with lifting devices, (cranes and hoisting devices).
- Preparations for the June 2004 move to the partially completed CLO are continuing.
- A planning meeting with OEMC and DCMA for the Earned Value Certification review was held in February.

**Assessment/Issues:**

Managing within budget. Continuing strong focus on cost control and contingency management. The transition of work from LANL to ORNL in April 2004 is going well.

**External Review Data:**

No additional progress on recommendations from external reviews was made in February

Review	Recommendations	Closed This Month	Open Actions
DOE SC Review (11/03)	25	0	22
DOE End Game Review (7/03)	5	0	2
DOE SC Review (5/03)	29	0	4

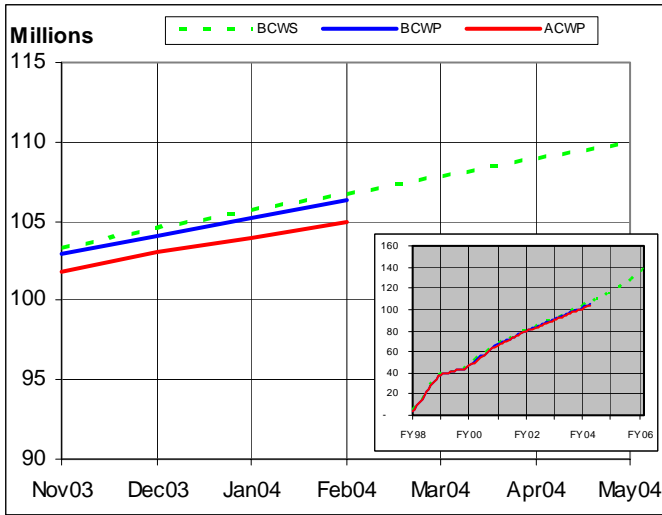
**Life of Project Market Experience:**

Major Awards (\$M)	Baseline Estimate (\$M)	Baseline Savings (\$M)	Percent savings over baseline
544.8	508.4	-36.3	-7.1%

Through March 26, 2004: 97% of the major procurements are already awarded.



**Performance:**



	Feb04	Cum-to-Date
<b>BCWS</b>	1,057	106,701
<b>BCWP</b>	1,058	106,284
<b>ACWP</b>	950	104,902
<b>CV</b>	108	1,383
<b>SV</b>	1	-417
<b>CPI</b>		
	1.11	1.01
<b>SPI</b>		
	1.00	1.00
<b>BAC (1.2)</b>		75,603
<b>BAC (1.10.3, 1.1.13, 1.10.5)</b>		71,128
<b>Planned % Complete</b>		72.7%
<b>Actual % Complete</b>		72.4%

**Cost Performance:**

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

*Corrective Action:* A PCR will be implemented to correct the move plan in the baseline.

**Schedule Performance:**

*Cause and Impact:* None required

*Corrective Action:* None required

**Milestones:**

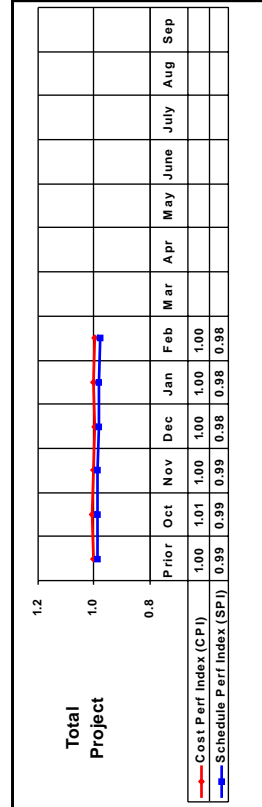
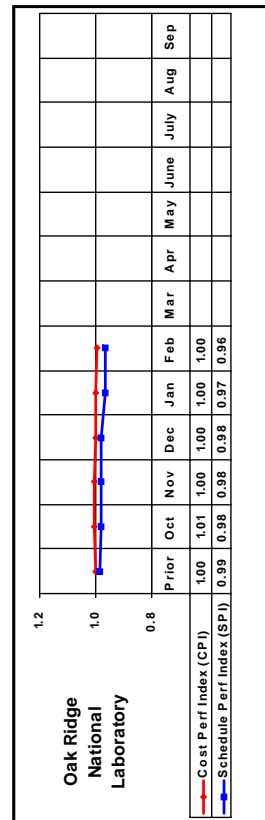
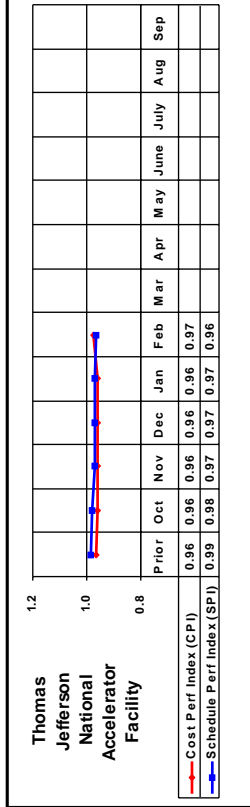
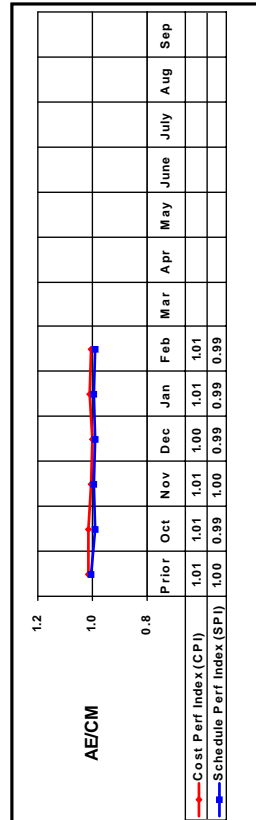
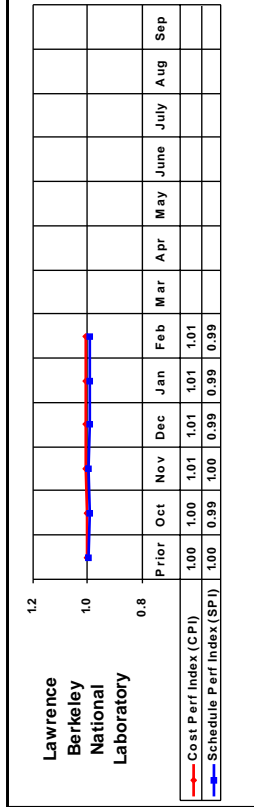
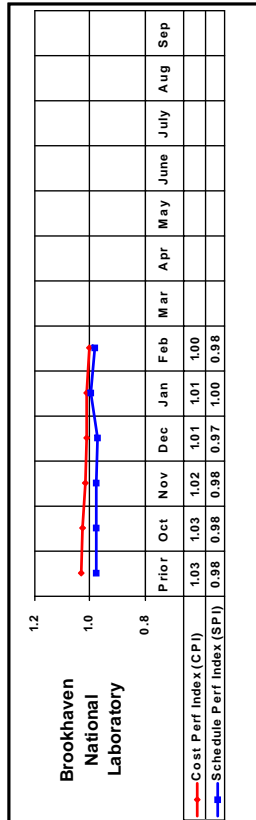
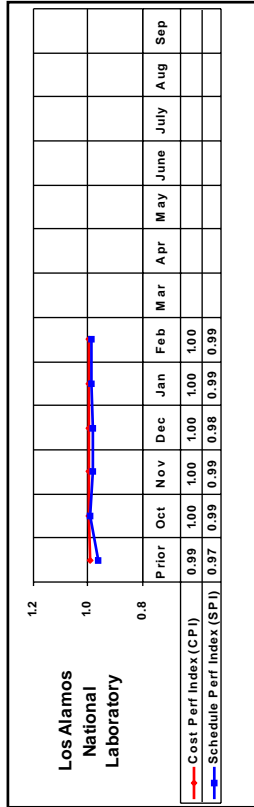
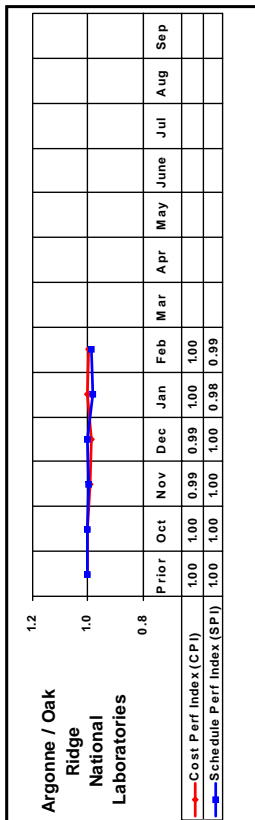
Description	Milestone Date	Forecast Date
EIS ROD	Jun-99	Jun-99 ✓
PSAR Issued for Approval	Dec-99	Dec-99 ✓
Submit PSAR to DOE for Approval	Dec-99	Dec-99 ✓
PSAD issued for Information	Sep-00	Sep-00 ✓
Issue FSAD for approval (Front End and Linac)	Sep-02	Aug-02 ✓
Issue FSAD for approval (Ring and Transfer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



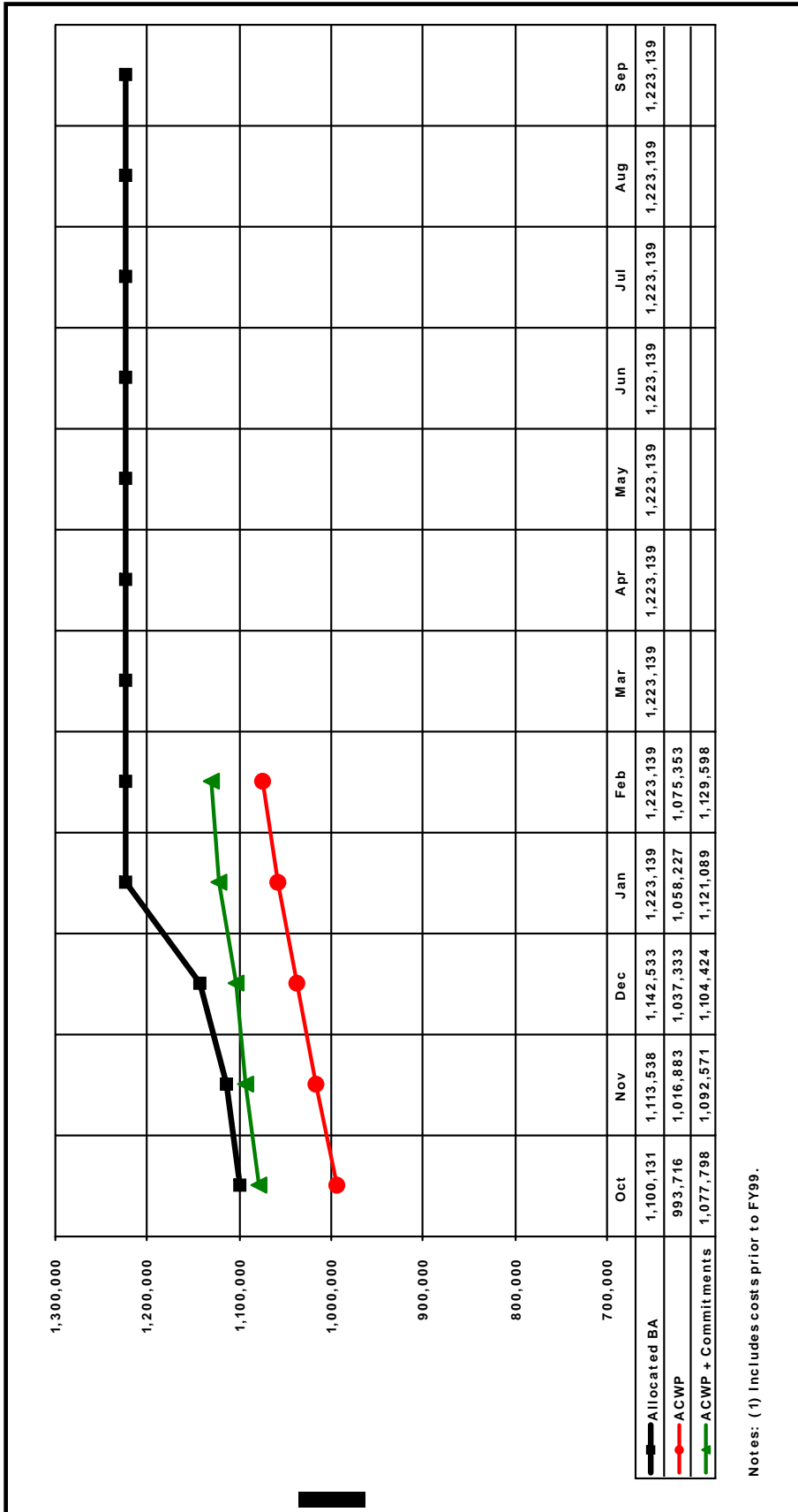
CLO stairs



# Overall Project Performance is stable



TPC Obligation Profile against BA



Phase funded procurements at the end of February could obligate an additional \$43.4 M, raising the total obligation potential to \$1,173M.





PROJECT TITLE:	Spallation Neutron Source Project		REPORTING PERIOD:												PROJECT NUMBER:		
			February 01, 2004 through February 29, 2004												99-E-334		
	PARTICIPANT NAME AND ADDRESS:		BCWS PLAN DATE:												START DATE:		
Oak Ridge National Laboratory Oak Ridge, TN		February 2004												October 1998			
		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	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF	WORK SCHED	WORK PERF					
1.02 Project Support	744.6	744.6	708.2	0.0	36.4	62,857.9	62,857.9	61,735.8	(0.0)	1,122.1	75,603	75,137	466				
1.03 Front End Systems	0.0	0.0	0.0	0.0	0.0	20,832.0	20,832.0	20,907.7	0.0	(75.7)	20,832	20,832	0				
1.04 Linac Systems	4,526.1	3,226.9	2,037.7	(1,299.2)	1,189.2	283,412.8	274,610.6	278,605.8	(8,802.2)	(3,995.2)	314,671	317,079	-2,408				
1.05 Ring & Transfer System	2,813.1	949.9	2,169.2	(1,863.3)	(1,219.4)	110,761.4	109,651.7	109,812.9	(1,109.7)	(161.2)	141,241	142,045	-804				
1.06 Target Systems	2,163.7	2,521.6	3,877.2	357.9	(1,355.6)	81,202.5	74,561.3	75,428.9	(6,641.3)	(867.7)	106,527	108,976	-2,449				
1.07 Instrument Systems	300.3	478.0	723.9	177.6	(245.9)	35,061.1	34,389.2	34,382.4	(671.9)	6.8	63,321	63,560	-239				
1.08 Conventional Facilities	6,188.1	5,057.1	5,417.5	(1,131.0)	(360.4)	321,623.1	318,888.9	316,826.9	(2,734.1)	2,062.1	370,152	379,880	-9,728				
1.09 Integrated Control Systems	904.2	718.9	866.6	(185.3)	(147.6)	41,038.9	39,848.0	39,515.0	(1,190.8)	333.1	59,632	59,686	-54				
<b>LINE ITEM SUBTOTAL</b>	<b>17,640.3</b>	<b>13,697.1</b>	<b>15,800.4</b>	<b>(3,943.2)</b>	<b>(2,103.3)</b>	<b>956,789.7</b>	<b>935,639.6</b>	<b>937,215.5</b>	<b>(21,150.1)</b>	<b>(1,575.9)</b>	<b>1,151,980</b>	<b>1,167,196</b>	<b>-15,216</b>				
<b>CONTINGENCY</b>											<b>40,720</b>	<b>25,504</b>	<b>15,216</b>				
<b>TOTAL LINE ITEM</b>	<b>17,640.3</b>	<b>13,697.1</b>	<b>15,800.4</b>	<b>(3,943.2)</b>	<b>(2,103.3)</b>	<b>956,789.7</b>	<b>935,639.6</b>	<b>937,215.5</b>	<b>(21,150.1)</b>	<b>(1,575.9)</b>	<b>1,192,700</b>	<b>1,192,700</b>	<b>0</b>				
1.01 Research & Development	129.4	115.7	58.2	(13.7)	57.5	98,918.6	98,902.1	99,098.2	(16.5)	(196.1)	101,874	101,874	0				
1.10 Operations	1,331.2	656.9	1,267.0	(674.3)	(610.1)	40,573.9	39,482.1	39,038.8	(1,091.7)	443.3	117,126	117,126	0				
<b>OTHER PROJECT COSTS SUBTOTAL</b>	<b>1,460.6</b>	<b>772.6</b>	<b>1,325.2</b>	<b>(688.0)</b>	<b>(552.6)</b>	<b>139,492.5</b>	<b>138,384.2</b>	<b>138,137.0</b>	<b>(1,108.2)</b>	<b>247.2</b>	<b>219,000</b>	<b>219,000</b>	<b>0</b>				
<b>TOTAL PROJECT COST</b>	<b>19,100.9</b>	<b>14,469.7</b>	<b>17,125.6</b>	<b>(4,631.2)</b>	<b>(2,655.9)</b>	<b>1,096,282.2</b>	<b>1,074,023.9</b>	<b>1,075,352.5</b>	<b>(22,258.3)</b>	<b>(1,328.7)</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: March 16, 2004</b>					



PROJECT TITLE:	REPORTING PERIOD:												PROJECT NUMBER:		
	February 01, 2004 through February 29, 2004												99-E-334		
	February 01, 2004 through February 29, 2004												October 1998		
PARTICIPANT NAME AND ADDRESS:	BCWS PLAN DATE:												COMPLETION DATE:		
	February 2004												June 2006		
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	5,417.5	5,417.5	(1,131.0)	(360.4)	WORK SCHED	WORK PERF	316,826.9	316,826.9	(2,734.1)	2,062.1	370,152	379,880	(9,728)
AE/CM	6,188.1	5,057.1	782.5	782.5	163.9	(188.9)	48,840.7	48,152.4	48,268.5	48,268.5	(688.3)	(116.1)	80,056	80,295	(239)
Argonne National Laboratory / ORNL	2,445.5	662.7	1,971.4	1,971.4	(1,782.8)	(1,308.7)	108,709.8	106,631.2	106,510.7	106,510.7	(2,078.6)	120.5	128,710	129,116	(406)
Brookhaven National Laboratory	777.6	368.1	(595.7)	(595.7)	(409.4)	963.8	63,282.6	61,039.0	62,715.2	62,715.2	(2,243.6)	(1,676.2)	66,044	66,380	(2,336)
Thomas Jefferson Laboratory	1,574.4	1,432.1	1,202.3	1,202.3	(142.3)	229.8	187,338.3	185,124.2	185,608.2	185,608.2	(2,214.1)	(484.0)	197,960	197,960	0
Los Alamos National Laboratory	68.7	78.7	71.2	71.2	9.9	7.5	28,624.4	28,466.8	28,295.0	28,295.0	(157.6)	171.8	29,663	29,663	0
Lawrence Berkeley National Laboratory	7,616.8	6,277.3	8,276.3	8,276.3	(1,339.5)	(1,999.0)	337,863.3	325,721.3	327,128.1	327,128.1	(12,142.0)	(1,406.7)	498,395	500,902	(2,507)
Oak Ridge National Laboratory	19,100.9	14,469.7	17,125.6	17,125.6	(4,631.2)	(2,655.9)	1,096,282.2	1,074,023.9	1,075,352.5	1,075,352.5	(22,258.3)	(1,328.7)	1,370,980	1,386,196	(15,216)
<b>WBS SUBTOTAL</b>															
<b>CONTINGENCY</b>															
<b>TOTAL PROJECT COST</b>	19,100.9	14,469.7	17,125.6	17,125.6	(4,631.2)	(2,655.9)	1,096,282.2	1,074,023.9	1,075,352.5	1,075,352.5	(22,258.3)	(1,328.7)	1,411,700	1,411,700	0
<b>RECONCILIATION TO CONTRACT BUDGET BASE</b>															
<b>DOLLARS EXPRESSED IN: Thousands</b>												<b>DATE: March 16, 2004</b>			



<b>PROJECT TITLE:</b> Spallation Neutron Source Project		<b>REPORTING PERIOD:</b> February 01, 2004 through February 29, 2004												<b>PROJECT NUMBER:</b> 99-E-334			
<b>PARTICIPANT NAME AND ADDRESS:</b> Oak Ridge National Laboratory Oak Ridge, TN		<b>BCWS PLAN DATE:</b> February 2004												<b>START DATE:</b> October 1998			
		<b>COMPLETION DATE:</b> June 2006															
<b>BUDGETED COST FOR WORK SCHEDULED (NON - CUMULATIVE)</b>																	
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	87,672	1,151,980	
1.02 Project Support	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.03 Front End Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.04 Linac Systems	-	-	-	-	83	(12)	(12)	(12)	(11)	(12)	(12)	(12)	(12)	(0)	-	0	
1.05 Ring & Transfer System	-	-	-	-	1,486	(131)	654	82	82	(2,235)	(144)	-	-	(288)	288	-	
1.06 Target Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.07 Instrument Systems	-	-	-	-	(668)	(56)	(41)	(22)	(27)	(27)	(140)	8	(136)	(1,083)	1,083	-	
1.08 Conventional Facilities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
1.09 Integrated Control Systems	-	-	-	-	(145)	(33)	(32)	(29)	(29)	(32)	(29)	(32)	332	-	-	-	
<b>TOTAL AUTHORIZED CHANGES</b>						755	(233)	569	20	(2,306)	(325)	(36)	184	(1,371)	1,371	-	
<b>PM BASELINE (END OF PERIOD)</b>	862,169	23,755	18,636	18,917	22,523	17,428	18,587	16,692	12,467	17,143	11,199	12,357	11,074	200,768	89,043	1,151,980	
<b>RECONCILIATION TO CONTRACT BUDGET BASE</b>																	
<b>DOLLARS EXPRESSED IN: Thousands</b>														<b>DATE: March 16, 2004</b>			

Project Change Requests implemented in February are as follows:

PCR Number	Description	PCR Cost Impact (\$K)
TG-04-004	Move TG Installation Work to 1.6.11	-
IS-04-003	Properly Load BCWS and Reschedule Activities due to Delays in Design	-
RI-04-005	BCWS refinement in 1.5.9	-
LI-04-010	Transfer Budget within WBS 1.4 Sub-elements to Address Cost Overruns and Impact.	-



**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)** — $TEC + OPC$