



Department of Energy  
Germantown, MD 20874-1290

APR 25 2007

MEMORANDUM FOR RAYMOND L. ORBACH  
DIRECTOR  
OFFICE OF SCIENCE

FROM: Patricia M. Dehmer  
Associate Director of the Office of Science  
for the Office of Basic Energy Sciences

SUBJECT: ACTION: Approve the Annual Update to Appendix A of the Project Execution Plan (PEP) for the Spallation Neutron Source (SNS) Project

ISSUE: The SNS PEP is required to be reviewed annually and revised as necessary in order to ensure that it contains current information. The SC portion (Appendix A – see Attachment 1) has been revised as the result of such a review and is provided for SC-1 approval. There are no material changes in the base document and no higher-level approvals are required. The Level 0 baseline project scope, Total Project Cost (\$1,411.7 million), and project completion date (June 2006) have remained unchanged.

BACKGROUND: The SNS PEP is structured as a Base Document (approved by the Acquisition Executive; contained for reference in Attachment 2), an Appendix A (approved by the Director, Office of Science), an Appendix B (approved by the Federal Project Manager), and an Appendix C (approved by the SNS Project Director at Oak Ridge National Laboratory). The annual review has determined that no changes are necessary to the Base Document; however, there was a need for certain changes to be made to bring Appendix A up to date.

DISCUSSION: To briefly summarize, Appendix A has been revised to:

- Clarify that the Office of Defense Programs is under the National Nuclear Security Administration;
- Update the indications of progress (shading) in the SNS Project Summary Schedule;
- Incorporate the Office of Basic Energy Sciences ES&H policy;



- Clarify the plans to approve the SNS facility's operational safety basis in two phases (first as an accelerator facility, and then after CD-4 as a Category 2 Nuclear Facility);
- Clarify the plan for transition to operations, including the criteria for achieving project completion (CD-4), which will be formally documented in a Project Completion Report;
- Reflect the project having baselined five neutron scattering instruments during the past year, and identify them by name;
- Note that other projects may be built at the SNS site on Chestnut Ridge, such as the Center for Nanophase Materials Sciences; and
- Clarify the definitions of three SC-level milestones, including specifying the requirements for issuing the Project Completion Report.

SENSITIVITIES: None

RECOMMENDATION: It is recommended that SC-1 approve the annual update to Appendix A of the SNS PEP.

#### Attachments

cc: w/o attachments  
M. Holland, ORO  
G. Malosh, ORO  
L. Price, ORO  
T. Mason, SNS  
C. Strawbridge, SNS

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**SPALLATION NEUTRON SOURCE  
PROJECT EXECUTION PLAN  
APPENDIX A**

**OFFICE OF SCIENCE PROGRAM  
PLANS AND CONTROLLED ITEMS**



Raymond L. Orbach  
Director, Office of Science

April, 2002

**SPALLATION NEUTRON SOURCE  
PROJECT EXECUTION PLAN  
APPENDIX A**

**1. INTRODUCTION**

This appendix of the SNS PEP supplements the base document by providing additional detail on management and execution of the SNS project. Level 1 baselines (technical, schedule, and cost) controlled by the Office of Science are identified, along with the thresholds for application of formal change control processes. Changes to this appendix are at the sole discretion of the Director, Office of Science, although all revisions are provided to the Acquisition Executive and to the DOE-ORO SNS Project Manager.

**2. MISSION NEED AND JUSTIFICATION**

See Sect. 2, Mission Need and Justification, of the Project Execution Plan, base document.

**3. PROJECT DESCRIPTION**

See Sect. 3, Project Description, of the Project Execution Plan, base document.

**4. MANAGEMENT SYSTEMS**

**4.1 Inter Program Coordination**

One of the partner laboratories working on the SNS project, Los Alamos National Laboratory (LANL), is programmatically a Defense Programs (DP) laboratory. Maintaining adequate attention to SNS activities at that DP laboratory is an essential element to the success of the multilaboratory effort and ultimately to the success of the SNS project. The Director, Office of Science, will maintain an understanding with the Deputy Administrator for Defense Programs, National Nuclear Security Administration, regarding the continuing need to consider impacts on the SNS project effort when planning and directing overall activities at LANL. A copy of this Memorandum of Agreement is attached to this appendix.

**4.2 Organization and Responsibilities**

The DOE program manager relies on and uses Office of Science and other Departmental staff organizations for support in execution of the SNS project.

A summary DOE organizational diagram for the SNS project is given in Figure A-1.

# DOE PROJECT ORGANIZATION

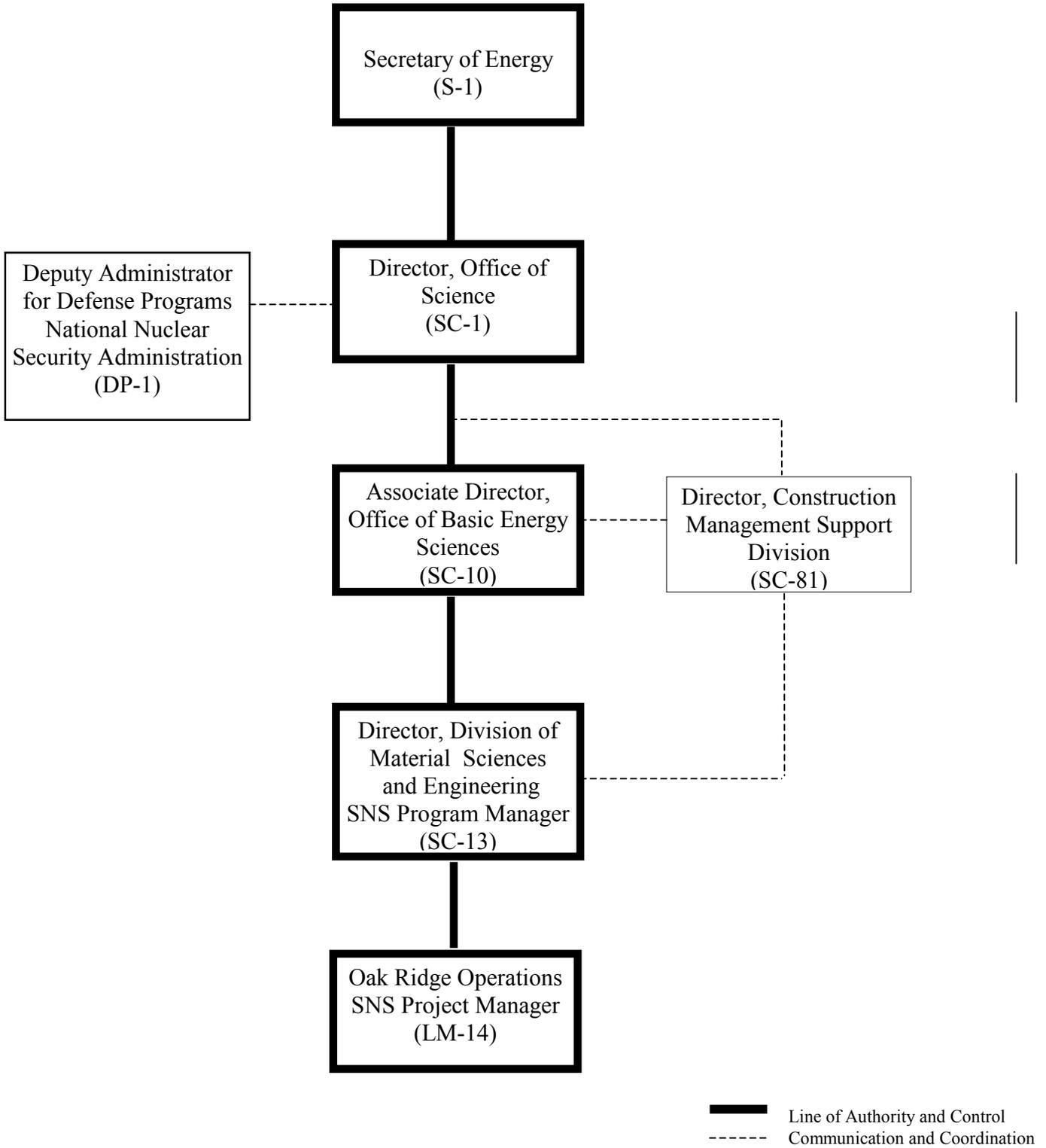


Figure A-1. DOE/SNS Summary Organization

### **4.3 Work Authorization**

Work authorization documents will be issued to the field to initiate, continue, or redirect project effort and to identify funds being allocated via an approved financial plan. These documents will be issued as needed, but no less than annually.

### **4.4 Project Monitoring and Assessment**

Monitoring and assessment of the SNS project will occur through routine interfaces among project participants (e.g., periodic informal conference calls among the contractor management, DOE-ORO project office, and DOE-SC staff), periodic formal project status reports, and project reviews organized by the Construction Management Division (SC-81). Such reviews will be typically conducted on a semiannual basis; however, ad hoc reviews on special topics (e.g., Environmental, Safety, and Health) may be held as deemed necessary by SC.

### **4.5 Level 1 Change Control**

All Level 0 and Level 1 changes will be submitted to the Office of Science Change Control Board Secretariat (SC-81). The Construction Management Support Division is responsible for administering the SC change control process.

### **4.6 Summary Schedule of DOE Milestones**

Project schedule milestones controlled by DOE, at Level 0 and 1, are presented in Figure A-2 below. A description of each milestone is given in Table A-1 at the end of this appendix.



## 5. ENVIRONMENT, SAFETY, HEALTH, AND SECURITY

**Siting**—The NEPA process was used to conduct a site selection process for the SNS facility. The SNS EIS (DOE/EIS-0247, April 1999) evaluated the environmental consequences of locating the facility at the preferred site at Oak Ridge National Laboratory (ORNL) and at alternative sites at Argonne National Laboratory, Los Alamos National Laboratory, and Brookhaven National Laboratory. A record of decision, based on this evaluation, was issued on June 18, 1999, by the Acquisition Executive that identified ORNL as the site for construction and operation of the SNS.

**Basic Energy Sciences Policy**—The Office of Basic Energy Sciences is committed to conducting research in a manner that ensures protection of the workers, the public, and the environment. Protecting the workers, the public, and the environment is a direct and individual responsibility of all BES managers and BES-supported researchers and their staff. Funds provided by BES for research will be applied as necessary to ensure that all BES research activities are conducted safely and in an environmentally conscientious manner. Only research conducted in this way will be supported. For the purposes of the SNS Project, “research” and “research managers” are interpreted as “construction” and “project managers”.

**Operational Safety Basis**—Approval of safety documents and authorization to commission and operate the SNS facility is divided into two phases.

The first phase is associated with commissioning and low power operation of all SNS facility systems, including the proton accelerator, storage ring, beam stops, and target systems (prior to radioisotope accumulation which transitions the target system into a nuclear facility). The SNS Project Manager is responsible for establishing and approving the safety basis and operations for this phase in accordance with DOE Order 420.2A, Safety of Accelerator Facilities.

The second phase is associated with high power operation of the facility, at which time certain target building systems will transition into a nuclear facility (successively, Category 3 and then Category 2) as the radioisotope inventory accumulates. This transition is planned to occur about six months to one year after project completion (CD-4). In July 1995, the Manager of Oak Ridge Operations was delegated authority to approve safety documents for Category 2 hazard facilities, with the understanding that such authority could not be re-delegated by the Oak Ridge Manager. However, for the SNS Project, Office of Science has chosen to grant this approval authority to the SNS Project Manager. The SNS Project Manager will coordinate document review processes with appropriate Oak Ridge and Headquarters staff. The Office of Science will seek delegation from the Secretary under DOE Order 425.1B, Startup and Restart of Nuclear Facilities, the authority to approve high power operation.

## 6. RESOURCE PLANNING

See Appendix D.

## 7. TRANSITION TO OPERATIONS

Once the facility is ready to place beam on target, a series of performance tests will be undertaken to demonstrate that all components of the facility are working properly and in concert for producing neutrons at a satisfactory level. For project completion (CD-4), the SNS must have in place all capital facilities necessary to achieve a proton power on target of  $\geq 1\text{MW}$ , and conducted initial performance tests to demonstrate operation at approximately 10% of the neutron flux expected at 1MW. These tests will consist of demonstrating that particles can be stored in the accumulator ring to a level of  $1 \times 10^{13}$  protons in a pulse, that those particles can be extracted from the storage ring in a single turn and be transported to the target, and that an integrated neutron flux from the target of  $5 \times 10^{-3}$  neutrons per steradian solid angle per incident proton measured viewing ambient moderator face. These tests will indicate that full-energy beam can be achieved, that multiturn stacking is working properly, that the single-turn kicker system is operating effectively, and that the target neutron efficiency is within the expected range.

The DOE Program/Project team will conduct a Project Completion Review to meet the objective of the “operational readiness review” described in DOE Order 413.3 (not to be confused with the Operational Readiness Review specified in DOE Order 425.1B for startup of a Nuclear Facility).

This review and completion of the performance tests will be documented in a Project Completion Report which will serve as the basis for a request to the Acquisition Executive for approval of CD-4. Approval of CD-4 completes the construction phase of the project, and the SNS will enter the normal research operations phase.

## **8. PROJECT BASELINES AND CHANGE CONTROL THRESHOLDS**

The SNS technical baseline shall be managed to provide the best accelerator-based neutron research facility within the Congressionally approved budget for the project. Applying this approach will provide accommodations for up to 24 instruments around the neutron source, but only a portion of those instruments are included in the line item project (approximately 10 were estimated in the CDR). The scientific user community has advised the DOE Office of Basic Energy Sciences that the SNS should keep pace with developments in scientific instruments; therefore, the average cost per instrument has roughly doubled in recent years. Although this translates into an initial suite provided within the project TEC of fewer than the ten instruments originally envisioned, the cumulative scientific capability of the SNS has increased more than ten-fold. As with all scientific user facilities such as SNS, additional and even more capable instruments will be installed over the course of its operating lifetime. Many of these future instruments will be provided by other entities, such as the National Science Foundation, other countries, as well as other DOE programs.

In addition, as part of the development of Oak Ridge National Laboratory, other buildings may be located on Chestnut Ridge, which is the site of the SNS and is located just across Bethel Valley Road from improvements planned for the main ORNL campus. Currently, the Center for Nanophase Materials Sciences (CNMS) will be located on Chestnut Ridge, because research activities at the CNMS will integrate nanoscale science research with neutron science; synthesis; and theory, modeling, and simulation. The CNMS will be adjacent to the SNS Laboratory – Office Building and will be connected to it by a walkway.



**OFFICE OF SCIENCE CONTROLS**

<b>COST (\$ Million)</b>	<b>BASELINE (Level 1)</b>			<b>CHANGE THRESHOLD</b>
	<b>WBS Element</b>	<b>Level 1 Control Values</b>	<sup>1/</sup> <b>Level 2 Control Values</b>	
	<b>1.2 Project Support</b>	<b>76.0</b>	<i>76.1</i>	For Level 1A: changes to TEC or TPC  For Level 1B: the smaller cumulative change of ≥ \$50M or 50% to each WBS level 2 cost
	<b>1.3 Front End</b>	<b>19.3</b>	<i>21.0</i>	
	<b>1.4 Linac Systems</b>	<b>260.9</b>	<i>289.9</i>	
	<b>1.5 Ring &amp; Trans. Sys.</b>	<b>146.6</b>	<i>151.5</i>	
	<b>1.6 Target Systems</b>	<b>93.3</b>	<i>100.5</i>	
	<b>1.7 Instrument System</b>	<b>60.0</b>	<i>63.7</i>	
	<b>1.8 Conventional Fac.</b>	<b>306.4</b>	<i>322.4</i>	
	<b>1.9 Integrated Control</b>	<b><u>58.1</u></b>	<i><u>59.7</u></i>	
	<b>TEC Subtotal (w/o Contingency)</b>	<b>1,020.6</b>	<i>1,084.8</i>	
	<b>Contingency</b>	<b><u>172.1</u></b>	<i><u>107.9</u></i>	
	<b>TEC</b>	<b>1,192.7</b>	<i>1,192.7</i>	
	<b>1.1 R&amp;D &amp; Pre-FY99</b>	<b>103.2</b>	<i>102.0</i>	
	<b>1.10 Pre-Operations</b>	<b><u>115.8</u></b>	<i><u>117.0</u></i>	
	<b>OPC Subtotal</b>	<b>219.0</b>	<i>219.0</i>	
	<b>Total Project Cost, TPC</b>	<b>1,411.7</b>	<i>1,411.7</i>	

<sup>1/</sup> Level 2 Control Values are for cumulative changes through BCP-02-SNS-002. Those values differ from the Level 1 Control Values because approved Level 2 changes do not exceed Level 1 Change Thresholds. Likewise, the project's performance measurement baseline may differ from the Level 2 Control Values because of lower tier changes that do not require Level 2 approval.

## **TABLE A-1**

### **Milestone Definitions**

#### **Level 0 – Acquisition Executive**

- 0-1. Critical Decision 1, Mission Need—See Sect. 4.6 of the Acquisition Executive document for milestone definition. Completion of this milestone is defined as a signed Secretarial Decision Memorandum from DOE confirming the completion/achievement/granting of CD-1.
- 0-2. Critical Decision 2, Baseline Approval—See Sect. 4.6 of the Acquisition Executive document for milestone definition. Completion of this milestone is defined as a signed Secretarial Decision Memorandum from DOE confirming the completion/achievement/granting of CD-2.
- 0-3. EIS Record of Decision—Completion is defined as a signed ROD by the Acquisition Executive.
- 0-4. Critical Decision 4, Acceptance/Completion—See Sect. 4.6 of the Acquisition Executive document for milestone definition. Completion of this milestone is defined as a signed Secretarial Decision Memorandum from DOE confirming the completion/achievement/granting of CD-4.

#### **Level 1A – Director, Office of Science**

- 1A-1. Start Line Item Project—Defined as the authorization to begin spending of Congressionally approved funds for the line-item portion of the project. Completion of this milestone was granted upon receipt of the line-item funds and the receipt of a DOE directive authorizing the spending of the available funds.
- 1A-2. EIS Record of Decision—See level 0, milestone 3.
- 1A-3. Critical Decision 3, Construction Approval—See Sect. 4.6 of the Acquisition Executive document for milestone definition. Completion of this milestone is defined as a signed Office of Science Decision Memorandum from DOE confirming the completion/achievement/granting of CD-3.
- 1A.4. Start Target Commissioning (first beam)—Defined as intentionally allowing protons to travel through the ring target beam transfer (RTBT) into the target vessel and striking the target core. Completion of this milestone is defined as the issuance of a memorandum, with supporting technical documentation, provided by the Target Division Director and Target subproject to the project office.

1A-5. Submit the Project Completion Report—Defined as the conduct of a Project Completion Review by the Program/Project team 1) to confirm that all capital facilities necessary to achieve proton power on target of at least 1 MW have been installed and certified to operate properly and safely, and 2) to assure that facility performance tests defined in Appendix A Section 7 have been successfully completed. Completion of this milestone will be defined as the issuance of the Project Completion Report.

### **Level 1B – Associate Director, Office of Basic Energy Sciences**

1B-1. Award architect-engineer/construction manager (AE/CM) Contract—Defined as the completion of all activities surrounding the bid and award process to purchase AE/CM services from a contractor. Completion of this milestone is defined as the contract documentation signed by the highest authority of both ORNL and the contractor finalizing the contract.

1B-2. Preliminary Safety Analysis Report (PSAR) Submitted to DOE—Defined as the completion of the PSAR and issuance to DOE for approval. Milestone completion will be achieved upon the issuance of this document, via transmittal record, from the project office to DOE ORO.

1B-3. Linac Design Complete—Defined as the completion of the linac final design review. Completion of this milestone will be awarded upon the issuance of a memorandum from the Accelerator Division manager to the project office stating the completion of the final design review and his or her concurrence and acceptance of the design package.

1B-4. Linac Tunnel Beneficial Occupancy Date (BOD)—Defined as the date on which beneficial occupancy of the linac tunnel at 1000 MeV is transferred from conventional facilities to the Accelerator Division. Completion of this milestone will be granted upon the notification to the project office from the linac senior team leader (STL) and the Accelerator Division that the facility has passed their walk through.

1B-5. Ring Tunnel BOD—Defined as the date on which beneficial occupancy of the HEBT, Ring, and RTBT is transferred from conventional facilities to the Accelerator Division. Completion of this milestone will be granted upon the notification to the project office by the Accelerator Division that the facility has passed their walk-through.

1B-6. Front-End Beam Available to Linac—Defined as the completion of initial front-end commissioning activities and the front-end diagnostic equipment and beam stop being removed to allow drift-tube linac (DTL) installation. The remaining front-end commissioning activities will occur concurrently with linac commissioning. The completion of this milestone will be granted upon receipt in the project office of a memorandum, with supporting technical documentation, from the front-end subproject and Accelerator Division Director stating that initial commissioning requirements have been achieved and that the beam is now available to the linac.

- 1B-7. Target Design Complete—Defined as the completion of the target final design review. Completion of this milestone will be awarded upon the issuance to the project office of a memorandum from the Experimental Facilities Division Director confirming the completion of the final design review and his or her concurrence and acceptance of the design package.
- 1B-8. Instrument Systems Design Complete—Defined as the completion of the instrument systems final design review for the first five instruments. Completion of this milestone will be awarded upon the issuance to the project office of a memorandum from the Experimental Facilities Division Director confirming the completion of the final design review and his or her concurrence and acceptance of the design package.
- 1B-9. Linac Beam Available to Ring—Defined as the completion of initial coupled-cavity linac (CCL) commissioning activities and the completion of the linac dump and the linac-achromat matching section (LAMS) commissioning. The remaining linac commissioning activities will occur concurrently with ring commissioning. The completion of this milestone will be granted upon the receipt in the project office of a memorandum, with supporting technical documentation, from the linac subproject and Accelerator Division Director stating that initial commissioning requirements have been achieved and that the beam is now available to the ring.
- 1B-10. Ring Beam Available to Target—Defined as the completion of initial ring commissioning activities and the completion of the extraction dump commissioning. The remaining ring commissioning activities will occur concurrently with target commissioning. The completion of this milestone will be granted upon the receipt in the project office of a memorandum, with supporting technical documentation, from the ring subproject and Accelerator Division Director stating that initial commissioning requirements have been achieved and that the beam is now available to the RTBT and target.

**MEMORANDUM OF AGREEMENT  
BETWEEN THE OFFICE OF SCIENCE  
AND THE  
OFFICE OF THE DEPUTY ADMINISTRATOR FOR DEFENSE PROGRAMS  
FOR THE  
SPALLATION NEUTRON SOURCE**

**1. PURPOSE**

The Spallation Neutron Source (SNS) Project is a multi-laboratory partnership, led by the SNS Project Office at Oak Ridge, Tennessee, involving Argonne, Brookhaven, Lawrence Berkeley, Los Alamos, and Oak Ridge National Laboratories, as well as the Thomas Jefferson National Accelerator Facility (TJNAF). This Memorandum of Agreement (MOA) establishes the commitment of the Office of the Deputy Administrator for Defense Programs, National Nuclear Security Administration (NNSA), to support execution of the SNS Project through formal and/or informal communications to the DOE Los Alamos Area Office, Albuquerque Operations Office, and to the Los Alamos National Laboratory (LANL). The Office of Science and NNSA recognize the importance and high priority of this project to the Department, and will work together to ensure its successful and timely completion. This updated MOA supercedes the initial (February 26, 1998) MOA between the Office of Energy Research and Defense Programs on the SNS project.

**2. BACKGROUND**

The Secretary approved the SNS Project Execution Plan on December 23, 1997. The Secretary noted that an important factor for the project's success was the coordination of the partner laboratories. The Oak Ridge Operations Office has established a MOA with all of the cognizant Operations Offices to define specific roles and expectations regarding the SNS Project. Also, the SNS Project Office has established a MOA among the six partner laboratories that defines their roles and work scope responsibilities.

**3. SCIENCE AND TECHNOLOGY GOAL**

The purpose of the SNS project is to provide a next-generation short-pulse spallation neutron source to meet the needs for scientific understanding and technological innovations critical to the Nation's science base as addressed in the Department Strategic Plan. The SNS capabilities are also consistent with NNSA's mission to support the science-based stockpile stewardship program and NNSA's program of the Los Alamos Neutron Science Center (LANSCE).

**4. MANAGEMENT ARRANGEMENTS**

The SNS project is a partnership among six DOE National Laboratories in the design and construction of a DOE Major System project. The SNS Project Execution Plan, of which this MOA is a part, describes the roles, responsibilities, and management interactions between the various Department participants and establishes the project baseline against which performance is measured.

## 5. PROJECT SCOPE

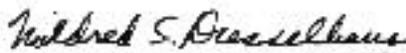
The SNS facility design consists of an injector-linear accelerator-accumulator ring system that delivers short proton pulses to a target/moderator system where neutrons are produced by a nuclear reaction called spallation. The moderated neutron beams are then used for neutron scattering experiments. The present SNS baseline calls for construction of the project to be completed by June 2006 within a Total Project Cost of \$1,411.7 million.

As a partner laboratory, LANL has overall responsibility for functional performance of the SNS linear accelerator (linac) system and the SNS global control system. For the linac, responsibility for design, procurement, fabrication, delivery, installation, and testing of system components is divided between LANL and TJNAF. LANL is responsible for all of the drift tube linac and for the room temperature portion of the coupled cavity linac (components to accelerate the proton beam up to about 185 MeV). Because of their expertise in superconducting radio-frequency linacs, TJNAF is responsible for the superconducting high-energy end of the linac (components to continue accelerating the proton beam up to about 1 GeV) and the attendant cryogenic equipment.

## 6. MOA COMMITMENT

The Office of the Deputy Administrator for Defense Programs commits to support the project execution processes of the Department's SNS project as a priority activity among the assigned tasks at LANL. The Office of Science commits to provide funding for the assigned tasks at LANL through ORNL and the SNS Project Office, and provide Headquarters oversight of the project. Both organizations will encourage collaboration between SNS and appropriate projects, such as the Accelerator Production of Tritium Project and LANSCE.

APPROVED:



Dr. Mildred S. Dresselhaus  
Director, Office of Science

APPROVED:



Madelyn R. Creedon  
Deputy Administrator for Defense Programs  
National Nuclear Security Administration