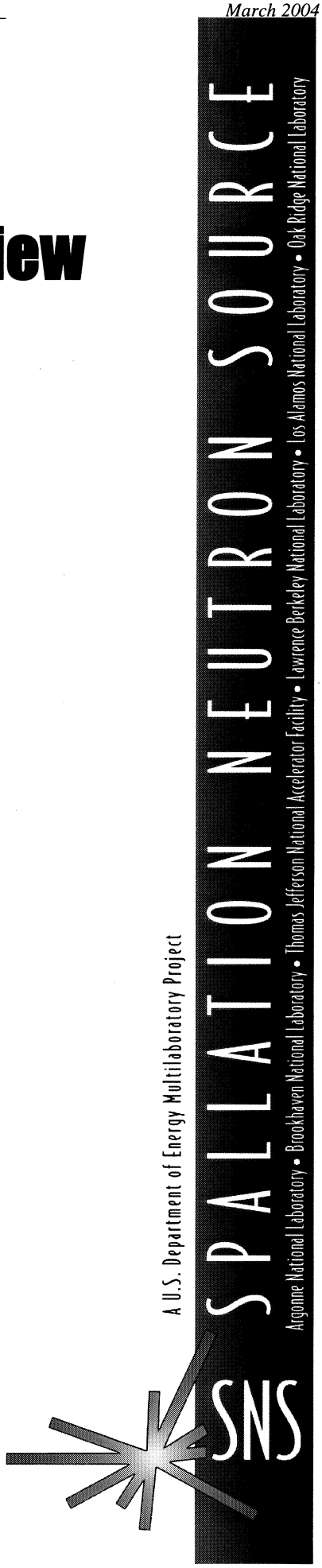
Accelerator Readiness Review Plan of Action Revision 4



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Accelerator Readiness Review
Plan of Action
Revision 4

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Revision 4

March 2004

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ACRONYMS

ARR	Accelerator Readiness Review
ASE	Accelerator Safety Envelope
CASE	Commissioning Accelerator Safety Envelope
CCL	Coupled Cavity Linac
CPP	Commissioning Program Plan
CD	Critical Decision
DOE	Department of Energy
DTL	Drift Tube Linac
FSAD	Final Safety Assessment Document
HEBT	High Energy Beam Transport
PFSAD	Preliminary Final Safety Assessment Document
PSAD	Preliminary Safety Assessment Document
RTBT	Ring to Target Beam Transport
SAD	Safety Assessment Document
SCL	Superconducting Linac
SNS	Spallation Neutron Source

1. INTRODUCTION

The Spallation Neutron Source (SNS) commissioning, from Front End to Critical Decision 4 (CD-4), the end of the construction project, and the transition to operations, will take place under the Department of Energy (DOE) Accelerator Safety Order, DOE Order 420.2 A.

According to the guidance for DOE Order 420.2A, "The basis of DOE approval of Accelerator facility activities remains the contractor submission of Safety Assessment Documents (SAD), an Accelerator Safety Envelope (ASE) and Accelerator Readiness Review (ARR) reports, with subsequent DOE review and approval of the ASE." In addition, the SNS Project Execution Plan requires DOE review and approval of the final SAD (FSAD).

The role of the DOE Field Office is specified in the draft guidance for DOE Order 420.2A. In Section II.A.3 under Accelerator Readiness Review it is stated that: "The role of DOE Field Offices (Operations/Area/Site Offices) in the ARR process is to: 'Request the contractor to prepare a proposed ARR Plan of Action and submit it to DOE for acceptance.'"

This document contains the Plan of Action for the SNS readiness review process. The dates listed in this document are the anticipated schedule dates based on the current SNS baseline project schedule. These dates depend critically on beneficial occupancy dates for conventional facility construction and delivery dates from vendors and partner laboratories. During the fabrication, testing and installation, some changes to these dates may occur. As changes to the SNS project baseline schedule occur, the dates in the Plan of Action will be adjusted.

The specific dates are shown in Appendix A of this document in Microsoft Project Gantt Chart format.

1.1 DESCRIPTION OF THE ARR PROCESS

Facility Description: The SNS baseline design is for a ~1GeV, 1.4 MW pulsed H^-/Proton beam directed to a target that is the source of secondary neutron beams used for scientific research.

Location: Oak Ridge, Tennessee

Program Considerations: The installation schedule requires commissioning tests for modules of the facility at the same time other modules are being installed. Furthermore, experimental beamlines become available sequentially for users.

Type of Accelerator Readiness Review: "Phased." The SNS Readiness Review Plan of Action is presented to the DOE for commissioning in modules. These commissioning modules are:

1. Front End (FE)
2. Drift Tube Linac Tank 1 (DTL)
3. Drift Tube Linac Tanks 2-3 (DTL)
4. Drift Tube Linac Tanks 4-6 (DTL) and Coupled Cavity Linac Modules 1-3(CCL)
5. Coupled Cavity Linac Module 4 and Superconducting Linac (SCL)
6. High Energy Beam Transport (HEBT)-Ring to Target Beam Transport (RTBT) to Extraction Dump
7. HEBT-Ring to RTBT to Target and Instruments

Reason for Selection of Type of ARR: Readiness is achieved by using the ARR process at the appropriate times in the project to maximize safety and readiness confidence and to minimize the time to project completion.

2. PREPARATION FOR COMMISSIONING

DOE Order 420.2A contains a list of requirements for the ARR process. This list includes a SAD and an ASE. Adequate training and qualification of personnel, written procedures, an internal safety review system, and a shielding policy must also be demonstrated.

The FSAD review and ARRs are held by the contractor, with review committees of independent experts, as specified in the guidance for DOE Order 420.2A. There will be a DOE observer at each of these reviews. There will also be a formal closeout of each review with the DOE Project. The DOE Project Manager authorizes the contractor to proceed with commissioning of each module.

The Preliminary Safety Assessment Document (PSAD) was approved in October 2001. A revision, the Preliminary Final Safety Assessment Document (PFSAD), was submitted for independent review in January 2002. The report from the independent review of the PFSAD concluded that the document was

adequate to cover the commissioning of the Front End and Linac modules. The FSAD for the Front End and Linac was submitted to DOE and approved in August 2002. The FSAD and ASE will evolve and will be presented once for the Linac modules and once again for the last two modules at the appropriate readiness review.

A Plan of Action was submitted to DOE prior to the ARR for the Front End module. Feedback from the Front End module ARR process was incorporated into this revised Plan of Action.

A commissioning program plan (CPP) was also approved by DOE in August 2002.

3. ACCELERATOR AND EXPERIMENTAL SYSTEMS

The ARR process for the Front End module was preceded by review and approval of the FSAD for the Front End and Linac commissioning modules. This FSAD included the Commissioning Accelerator Safety Envelope (CASE) (Rev. 1) for the Front End and Linac.

The ARR process for the HEBT-Ring-RTBT to Extraction Dump will be preceded by a review of the FSAD for the HEBT-Ring-RTBT to Target and Instruments module. This FSAD will include the CASE (Rev. 2) for the HEBT-Ring-RTBT to Extraction Dump. The CASE (Rev. 3) for Target and Instruments will be reviewed prior to the ARR for RTBT to Target and Instruments and will be incorporated into the FSAD at that time.

The following review and commissioning sequence will be followed for each module. It will be described in detail below for the Module 1, Front End commissioning.

The Front End ARR was conducted by an independent ARR team, with a DOE observer, over a period of approximately seven weeks. The first five weeks of the review period were devoted to preparation of review materials and construction of an ARR web site to allow easy remote access by the reviewers. We intend to build on this documentation, which will shorten the preparation period for subsequent ARRs. The ARR team site visit closeout ended with a "punch list" of items which were to be completed prior to a recommendation for turn on approval.

Following the ARR team site visit closeout, the "punch list" items were addressed and a final ARR team closeout was held. This closeout ended with a recommendation to the DOE Project Manager for authorization to proceed, which was granted on October 30, 2002.

Module 2, DTL Tank 1 commissioning, followed an activity sequence similar to the one which was followed the Module 1, the Front End commissioning, but including Lessons Learned from the Front End ARR. Specifically, prior to the commencement of DTL Tank 1 ARR, a formal declaration of "readiness to Commission DTL Tank 1" was made by the Project. This occurred on August 11, 2003. The formal contractor ARR site visit and review took place from August 12-14, 2003. Following the site visit, a formal ARR closeout took place to close out "punch list" and other items listed as "to be completed prior to commissioning" in the ARR site visit. The closeout took place on August 21, 2003. The committee recommended to the DOE Project Manager that authorization to proceed should be granted. DOE permission to proceed was granted on August 26, 2003.

Module 3, the DTL Tank 2-3 commissioning, will follow the same ARR activity sequence as was followed for Module 2, DTL Tank 1 commissioning. Specifically, prior to the commencement of DTL Tank 2-3 commissioning activities, a formal declaration of readiness will be made and a formal contractor ARR site visit and review will take place. Following the site visit, a formal ARR closeout will take place to close out any "punch list" or other items listed as "to be completed prior to commissioning" in the ARR site visit. This process will be followed for the remaining modules, which consist of:

4. DTL Tanks 4-6 and CCL Modules 1-3
5. CCL Module 4 and the SCL
6. HEBT-Ring-RTBT to Extraction Dump
7. HEBT-Ring-RTBT to Target and Instruments

Following RTBT to Target commissioning, CD-4 performance criteria will be achieved using sufficient instrument capability. Additionally, the low power operations safety envelopes for the Accelerator, Target, and Instruments will have been approved. Commissioning of completed Instruments will begin during the low power operation period (following CD-4) when sufficient beam power becomes available.

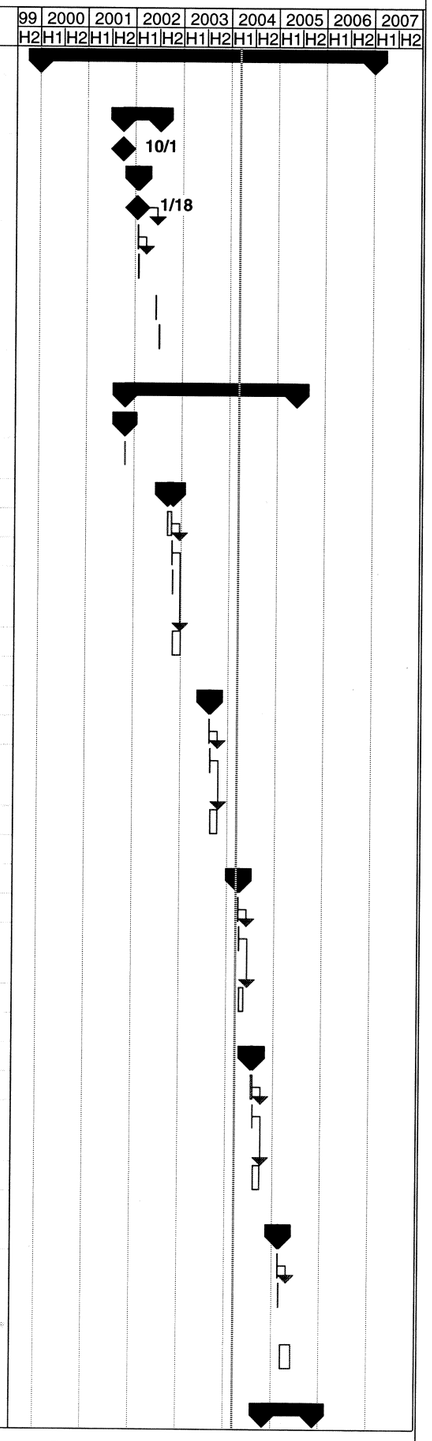
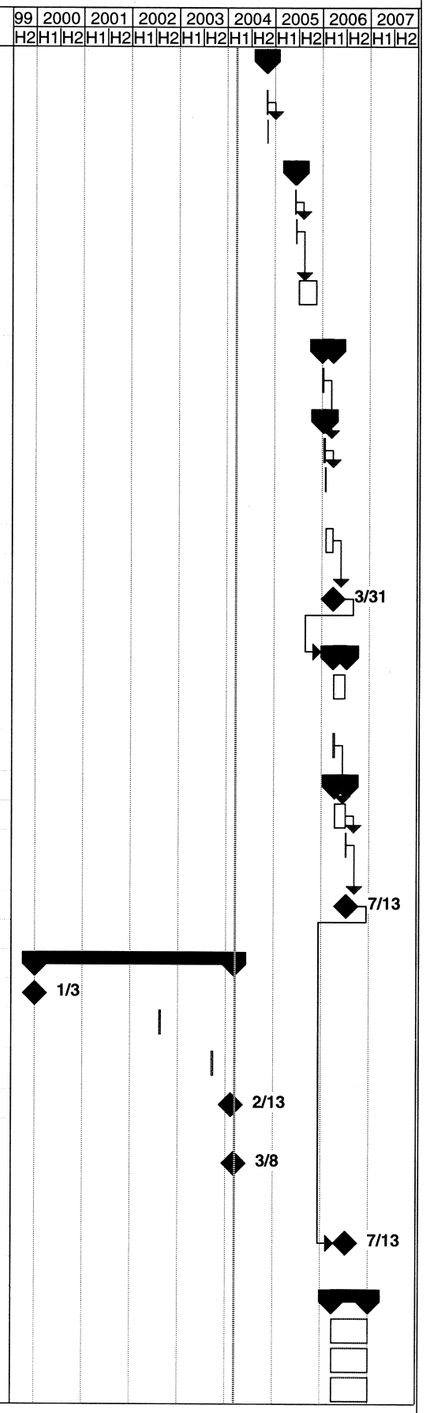
An Operational ARR will take place after CD-4. This review will cover Accelerator Readiness for high power operation.

APPENDIX A

PLAN OF ACTION
GANTT CHART

Mar 8 '04

ID	Task Name	Duration	Start	Finish	Details	Reason for Step
1	**Plan of Action**	**1831 days**	**Jan 3 '00**	**Jan 4 '07**		
2						
3	**Preparation for Commissioning**	**206 days**	**Oct 1 '01**	**Jul 11 '02**		
4	PSAD Rev#0 Approved	0 days	Oct 1 '01	Oct 1 '01	Approved	SAD Required by DOE O 420.2A
5	**PFSAD Development**	**10 days**	**Jan 18 '02**	**Jan 31 '02**		**SAD Required by DOE O 420.2A**
6	PFSAD Issued	0 days	Jan 18 '02	Jan 18 '02	Issued for Review	SAD Required by DOE O 420.2A
7	Conduct PFSAD Review	2 days	Jan 23 '02	Jan 24 '02	DOE Project Office observer	SAD Required by DOE O 420.2A
8	Review Team Closeout	5 days	Jan 25 '02	Jan 31 '02	Closeout with DOE Project Manager; DOE Project Manager Authorization to Proceed	SAD Required by DOE O 420.2A DOE Approval Required in PEP
9	**Plan of Action for Readiness Determination**	**5 days**	**Jun 10 '02**	**Jun 14 '02**	**DOE PM Acceptance and Feedback**	**Guidance for DOE 420.2A**
10	**Submit Commissioning Program Plan**	**1 wk**	**Jul 5 '02**	**Jul 11 '02**	**Submit Commissioning Program Plan**	**Guidance for DOE 420.2A**
11						
12	**Accelerator Systems**	**943 days**	**Oct 23 '01**	**May 31 '05**		
13	**FSAD for Front End and Linac (Includes ASE (Rev#1) for Front End and**	**1 day**	**Oct 23 '01**	**Oct 23 '01**		**SAD Required by DOE O 420.2A**
14	FSAD for Front End and Linac Closeout	1 day	Oct 23 '01	Oct 23 '01	Closeout with DOE Project Manager; DOE Project Manager Authorization to Proceed	SAD Required by DOE O 420.2A DOE Approval Required in PEP
15	**ARR for Front End**	**33 days**	**Sep 16 '02**	**Oct 30 '02**		**ARR Required by DOE O 420.2A**
16	Preparation for ARR for Front End	5 wks	Sep 16 '02	Oct 18 '02		
17	ARR for Front End	5 days	Oct 21 '02	Oct 25 '02	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
18	ARR Closeout	3 days	Oct 28 '02	Oct 30 '02	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
19	**Commission Front End**	46 days	Oct 29 '02	Dec 31 '02		Commissioning
20						
21	**ARR For DTL Tank 1**	**8 days**	**Aug 12 '03**	**Aug 21 '03**		
22	**ARR for DTL Tank 1**	3 days	Aug 12 '03	Aug 14 '03	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
23	ARR Closeout	3 days	Aug 19 '03	Aug 21 '03	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
24	**Commission DTL Tank 1**	41 days	Aug 22 '03	Oct 17 '03		Commissioning
25						
26	**ARR for DTL Tanks 2-3**	**8 days**	**Mar 29 '04**	**Apr 7 '04**		
27	ARR for DTL Tanks 2-3	4 days	Mar 29 '04	Apr 1 '04	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
28	ARR Closeout	3 days	Apr 5 '04	Apr 7 '04	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
29	**Commission DTL Tanks 2-3**	**26 days**	**Apr 8 '04**	**May 13 '04**		
30						
31	**ARR for DTL Tanks 4-6 and CCL Modules 1-3**	**15 days**	**Jul 12 '04**	**Jul 30 '04**		
32	Conduct ARR for DTL Tanks 4-6 and CCL Modules 1-3	12 days	Jul 12 '04	Jul 27 '04	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
33	ARR Team Closeout	3 days	Jul 28 '04	Jul 30 '04	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
34	**Commission DTL Tanks 4-6 and CCL Modules 1-3**	40 days	Aug 2 '04	Sep 24 '04		Commissioning
35						
36	**ARR for CCL Module 4 and SCL**	**9 days**	**Feb 14 '05**	**Feb 24 '05**		
37	Conduct ARR for CCL Module 4 and SCL	3 days	Feb 14 '05	Feb 16 '05	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
38	ARR Team Closeout	4 days	Feb 21 '05	Feb 24 '05	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
39	**Commission CCL Module 4 and SCL**	58 days	Mar 11 '05	May 31 '05		Commissioning
40						
41	**Ring Systems**	**277 days**	**Oct 28 '04**	**Nov 18 '05**		



ID	Task Name	Duration	Start	Finish	Details	Reason for Step
42	**FSAD Issued for HEBT-Ring-RTBT to Target and Instruments (Includes ASE (Rev#2) for HEBT-Ring-RTBT to Extraction Dump)**	**6 days**	**Oct 28 '04**	**Nov 4 '04**		**SAD Required by DOE O 420.2A**
43	FSAD for HEBT-Ring-RTBT to Target and Instruments issued for Reviev	5 days	Oct 28 '04	Nov 3 '04		SAD Required by DOE O 420.2A
44	FSAD for HEBT-Ring-RTBT to Target and Instruments	1 day	Nov 4 '04	Nov 4 '04	Closeout with DOE Project Manager; DOE Project Manager Authorization to Proceed	SAD Required by DOE O 420.2A DOE Approval Required in PEP
45	**ARR for HEBT-Ring-RTBT to Extraction Dump**	**10 days**	**Jun 6 '05**	**Jun 17 '05**		**ARR Required by DOE O 420.2A**
46	Conduct ARR for HEBT-Ring-RTBT	4 days	Jun 6 '05	Jun 9 '05	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
47	ARR Team Closeout	5 days	Jun 13 '05	Jun 17 '05	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
48	**Commission HEBT-Ring-RTBT to Extraction Dump**	98 days	Jul 6 '05	Nov 18 '05		Commissioning
49						
50	**Target Systems**	**62 days**	**Jan 2 '06**	**Mar 28 '06**		
51	**ASE(Rev#3) Target Commissioning and Low Power Operations Approval Sequence**	9 days	Jan 2 '06	Jan 12 '06	DOE Project Manager approves;Review Team - Project Office, other Contractor (optional)	ASE Required by DOE O 420.2A
52	**ARR for RTBT to Target and Instruments 2, 4A and 4B**	**13 days**	**Jan 13 '06**	**Jan 31 '06**		**ARR Required by DOE O 420.2A**
53	Conduct ARR for RTBT to Target and Instruments 2, 4A and 4B	10 days	Jan 13 '06	Jan 26 '06	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
54	ARR Team Closeout	3 days	Jan 27 '06	Jan 31 '06	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
55	**Commission RTBT to Target using one Instrument to CD-4 Requirements**	**40 days**	**Feb 1 '06**	**Mar 28 '06**		**Commissioning**
56						
57	**CD-4**	**0 days**	**Mar 31 '06**	**Mar 31 '06**	**Contractor/ORO/SC Recommendation**	**Project Execution Plan**
58						
59	**Low Power Operation**	**75 days**	**Mar 31 '06**	**Jul 13 '06**		
60	Commission Target at Low Power	65 days	Apr 3 '06	Jun 30 '06		Commissioning and Low Power Operation
61						
62	**Operational Accelerator Safety Envelope Review Process**	2 wks	Mar 31 '06	Apr 13 '06	DOE Project Manager approves;Review Team, DOE Project Office, other Contractor (optional)	ASE Required by DOE O 420.2A
63	**Operational ARR**	**65 days**	**Apr 14 '06**	**Jul 13 '06**		**ARR Required by DOE O 420.2a**
64	Conduct Operational ARR	60 days	Apr 14 '06	Jul 6 '06	DOE Project Office observer, Committee turnover of punch list	ARR Required by DOE O 420.2A
65	ARR Team Closeout	5 days	Jul 7 '06	Jul 13 '06	Contractor closeout of ARR punch list with DOE Project Manager; DOE Project Manager Authorization to Proceed	ARR Required by DOE O 420.2A
66	**Accelerator Approved for High Power Operations**	0 days	Jul 13 '06	Jul 13 '06		ARR Required by DOE O 420.2a
67						
68	**Target Facility**	**1092 days**	**Jan 3 '00**	**Mar 8 '04**		
69	**PSAR**	**0 days**	**Jan 3 '00**	**Jan 3 '00**	**Submitted**	DOE O 5480.23
70	**PSAR Update**	**10 days**	**Aug 12 '02**	**Aug 23 '02**	**Focussed on Seismic, Fire and Hg plume; DOE Project Manager Approves**	Verbal Agreement with ORO
71	**PSAR Update**	**10 days**	**Sep 16 '03**	**Sep 29 '03**	**Focussed on Seismic, Fire and Hg plume; DOE Project Manager Approves**	**Verbal Agreement with ORO**
72	**PSAR Revision**	**0 days**	**Feb 13 '04**	**Feb 13 '04**	**Submitted 12/30/2003**	Verbal Agreement with ORO
73						
74	**Detailed plans for the sequence of future safety documents and readiness reviews are currently being reevaluated.**	**0 days**	**Mar 8 '04**	**Mar 8 '04**		
75						
76		**0 days**	**Jul 13 '06**	**Jul 13 '06**		
77						
78	**Instrument Systems**	**200 days**	**Mar 31 '06**	**Jan 4 '07**		
79	**Commission Instrument 2**	**10 mons**	**Mar 31 '06**	**Jan 4 '07**	**HEBT-Target-Instrument ARR is a prerequisite**	**Commissioning**
80	**Commission Instrument 4A**	**10 mons**	**Mar 31 '06**	**Jan 4 '07**	**HEBT-Target-Instrument ARR is a prerequisite**	**Commissioning**
81	**Commission Instrument 4B**	**10 mons**	**Mar 31 '06**	**Jan 4 '07**	**HEBT-Target-Instrument ARR is a prerequisite**	**Commissioning**