

Department of Energy

Office of Science ORNL Site Office P.O. Box 2008 Oak Ridge, Tennessee 37831-6269

March 25, 2023

Mr. Jeff W. Smith, Interim Director Oak Ridge National Laboratory UT-Battelle, LLC Post Office Box 2008 Oak Ridge, Tennessee 37831-6241

Dear Mr. Smith:

DEPARTMENT OF ENERGY (DOE) ORDER 420.2D, SAFETY OF ACCELERATORS, IMPLEMENTATION PLAN APPROVAL

Reference: Letter from J. Scott Branham to Johnny O. Moore, subject, *Contract* DE-AC05-00OR22725, Publication of Order 420.2D, dated January 25, 2023

My staff has reviewed Implementation Plan for DOE Order 420.2d, *Safety of Accelerators*, submitted in the reference letter. No issues were identified in this review, and I approve the implementation plan.

If there are any questions or additional information required, please contact Chad Huffman at (865) 576-0717 or Michael Herr at (865) 241-2182.

Sincerely,

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Johnny O. Moore, Manager ORNL Site Office

cc: David W. Freeman, ORNL Bart O. Iddins, ORNL Director's Files Holly H. Alemar, SC-OSO Michael G. Herr, SC-OSO Chad K. Huffman, SC-OSO



PO Box 2008 Oak Ridge, TN 37831-6231 (865) 241-7614 | branhams@ornl.gov

October 2, 2023

Mr. Johnny O. Moore Manager, ORNL Site Office U.S. Department of Energy Post Office Box 2008 Oak Ridge, Tennessee 37831-6269

Dear Mr. Moore:

Contract DE-AC05-00OR22725, Publication of Department of Energy (DOE) Order 420.2D, Safety of Accelerators, dated September 9, 2022

Reference: Letter, from J. Scott Branham to Johnny O. Moore, Transmittal of Implementation Plan for Department of Energy (DOE) Order 420.2D, *Safety of Accelerators*, dated September 9, 2022, letter dated January 18, 2023

UT-Battelle LLC (UT-Battelle) is submitting, *Implementation Plan Actions to implement the Requirements of DOE Order 420.2D Safety of Accelerators*, Revision 1, to modify commitment Action Number 10¹. The comment statement cited in Table 2, Revision 1, for Action 26063.1.10² was revised to read *Submit the USI Process description to the DOE Oak Ridge Site Office for approval*. There is no change to the commitment action statement date.

The revision to Action 26063.1.10 commitment statement is being made to align with UT-Battelle's implementation of requirement, Contractor Requirement Document (CRD) Paragraph 2.f, *Unreviewed Safety Issue (USI) Process*.

Michael Herr from your office has been briefed on this revision.

If the revised commitment action statement for Action 26063.1.10 meets your approval, please sign below, and return to Paul Pehrson, at Building 4500N, MS 6250. Upon receipt of revision approval, the compliance line for DOE Order 420.2D will be revised in the UT-Battelle Appendix E, List B, and will be reported in the appropriate Requirements Change Notice quarter.

MANAGED BY UT-BATTELLE FOR THE US DEPARTMENT OF ENERGY

¹ See Table 2. 420.2D CRD, Program Elements page 7 of 8 of the Implementation Plan Actions to implement the Requirements of DOE Order 420.2D Safety of Accelerators, Revision 1.

² Oak Ridge National Laboratory Assessment and Commitment Tracking System action number.

Mr. Johnny O. Moore Page 2 October 2, 2023

If you have any questions or need additional information, please contact Paul Pehrson at (865) 576–7929.

Sincerely,

Scott Branham Chief Financial Officer

Implementation Plan Actions to implement the Requirements of DOE O 420.2D Safety of Accelerators, Revision 1

JSB: nas

Enclosure:

c: Michele G. Branton, SC-OSO Thomas E. Copinger Jens Dilling G. Drew Fuller John A. Gearhart Jennifer G. Hamilton, SC-CSC Michael Herr, SC-OSO Dana M. Hewit Susan S. Hubbard Mary D. Hudson Chad K. Huffman, SC-OSO Chrystal R. Jones, SC-CSC Judson A. Kingman, SC-OSO Brittany B. Logan, SC-OSO David J. Mandl Paul B. Pehrson Fulvia C. Pilat Jacob P. Platfoot Griffin D. Roblyer, SC-OSO Jeffrey W. Smith – RC Michael W. Stafford Balendra Sutharshan Michael S. Whittenbarger

Date:

Approved:

11/21/2023

may O Moore, Manager, ORNL Site Office

Implementation Plan Actions for DOE 0 420.2D Safety of Accelerators, Revision 1 of Table 2,

EXEMPTIONS/EQ	RD UIVALENCIES	Status Of Compliance: Not Fully Implemented
Requirements: Par	agraph 1 (a thru c)	nger us skie of state
 with Department establish a perior provided in sect the approved exact a. Exemption <i>Industrial</i> from require b. Exemption this CRD. c. Equivalence (1) Devices N43.2-202 (2) Devices <i>Installation</i> (3) Devices <i>Radiograp</i> (4) Neutron Measurement <i>Generators</i> (5) Devices 	s operated at or below 10 MeV in accordance with NC ccelerator Facilities, and/or ANSI- HPS N43.1-2011, J	Program, current version. The contractor must ad devices granted exemptions or equivalencies D) continue to be operated under the conditions of deral Regulations (CFR) Part 34, <i>Licenses for</i> <i>ndustrial Radiographic Operations</i> , are exempt as are exempt from requirements in section 2.b of rements in section 2.a.(1) and 2.a.(2) of this CRD. dards Institute/Health Physics Society (ANSI/HPS) <i>cence Analysis Equipment</i> ; <i>General Radiation Safety Standard for</i> <i>Sources, Energies up to 10 MeV</i> ; <i>Radiological Safety Standard for the Design of</i> <i>elow 1 MeV</i> (Reaffirmed 2013); th National Council on Radiation Protection and <i>nd Measurement of Low-Voltage Neutron</i> RP Report 144- 2003, <i>Radiation Protection for</i>
Current Status	The DOE 420.2D Equivalency/Exemption requirem the previous order (DOE O 420.2C) that allowed m Exempt devices at ORNL currently include Radiati O 420.2D definition of "accelerator" and the Beam Sources (SNS). Under the provisions of DOE O 42	any devices at ORNL to be considered exempt. on Generating Devices (RGDs) that meet the DOE Test Facility (BTF) at the Spallation Neutron

¹ Evaluation of Request For The Extension of Operations For Exemption From the Provisions of Department Of Energy (DOE) Order 420.2C For The Spallation Neutron Source (SNS) Beam Test Facility (BTF), Letter From M. Herr To J. Moore, September 27, 2017. Implementation Plan Actions for DOE 0 420.2D Safety of Accelerators, Revision 1 of Table 2,

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	accelerators. When fully implemented, no device at ORNL will fall under the exemption or equivalency provisions of newly issued DOE O 420.2D. The SBMS Accelerator Safety Subject Area will be revised to ensure that any future requests for exemptions (or equivalencies) are compliant with the applicable DOE O 420.2D requirements.	
Action required to implement	 Revise the Accelerator Safety SBMS Subject Area to be consistent with the Exemptions/Equivalencies requirements promulgated in Order 420.2D. Revise the Radiation Generating Devices SBMS Subject Area to be consistent with Exemptions/Equivalencies requirements promulgated in Order 420.2D. 	
ACTS Number	<u>26063.1.1</u> and <u>26063.1.2</u>	Commitment Date: August 31, 2023

Table 1. 420.2D Contractor Requirements Document	Status Of Compliance: Not Fully Implemented
EXEMPTIONS/EQUIVALENCIES	

Requirements: Paragraph 1.d

Contractors who manage accelerators and their operations with the potential for inadvertent criticality must implement a DOE-approved criticality safety program in accordance with DOE O 420.1, *Facility Safety*, current version, in addition to the requirements of this CRD. This requirement cannot be exempted under the provisions of section 3.c. of DOE O 420.2D, *Safety of Accelerators*, or this CRD.

Current Status	with the potential for criticality. Consistent with <i>Accelerator Safety</i> SBMS Subject Area already s criticality comply with the SBMS <i>Nuclear Critic</i>	<i>ality Safety</i> Subject Area. need to be revised to reflect the specific wording
Action required to implement	Revise the Accelerator Safety SBMS Subject Area to implement the specific requirements promulgated in CRD Paragraph 1.d of DOE O 420.2D.	
ACTS Number	26063.1.3	Commitment Date: August 31, 2023

2.0 PROGRAM ELEMENTS

Table 2. 420.2D CRD PROGRAM ELEMENTS	s	Status Of Compliance: Not Fully Implemented
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Implementation Plan Actions for DOE O 420.2D Safety of Accelerators, Revision 1 of Table 2,

Requirements: Paragraph 2.a

Contractors that manage accelerators and their operations under this CRD must establish the following program elements prior to commissioning and routine operations:

(1) A safety analysis or analysis of postulated worst-case accident for every accelerator managed under this CRD;

(2) Clearly defined roles and responsibilities for accelerator activities including those for training and procedures; and (3) A current listing/inventory of accelerators managed under this Order and exemptions or equivalencies to this Order. An approved Integrated Safety Management Program, in accordance with 48 CFR 970.5223-1, *Integration of Environment*, *Safety, and Health into Work Planning and Execution*, may be used to satisfy requirements for 2.a.(1) and 2.a.(2) above. Accelerators operated at or below 10 MeV that involve only unmodified commercially available equipment, including electron microscopes and ion implant devices, may use manufacturer documentation appropriately addressing the safety analysis, training, and procedures to satisfy requirements for 2.a.(1) and 2.a.(2), above, if the accelerator is maintained and operated according to the manufacturer recommendations.

Current Status		ubject Area addresses the three program elements shown rea is only applicable to the SNS accelerator facility. SNS is 0 420.2D requirements shown above.	
	Under 420.2D, RGD accelerator devices and the BTF will no longer be exempt and will be required to comply with the requirements shown above. Additionally, RGD accelerator devices and the BTF will need to be reflected in the ORNL listing of accelerators.		
	Plan ² , ORNL plans to point to the existing compliance with the Order 420.2D requir RGDs under the provisions of the ORNL <i>Radiation Generating Devices</i> SBMS Sub 420.2D requirements. While the existing some revisions may be warranted to help crosswalk of the revised RGD program w The existing SBMS Radiation Generating RGD devices. Consistent with the FAQs, inventory requirement listed above.	ith the FAQs provided in the DOE O 420.2D Implementation g <i>Radiation Generating Device</i> SBMS Subject Area to show ements shown above. Currently, ORNL safely manages Radiological Protection SBMS Management System. The oject Area will need to be revised to directly reference RGD program meets the intent of the requirements above, better align with the specific wording of the new order. A ith CRD requirements 2.a.(1 thru 3) will be developed. better subject Area already requires an inventory of all the existing RGD inventory will be referenced to meet the ets the 420.2D requirements shown above; except that it is	
	presently considered exempt and not liste		
Action required to implement	 Revise the Accelerator Safety SBMS Subject Area to implement the program element requirements of CRD Paragraph 2.a of DOE O 420.2D. Revise the Radiation Generating Devices SBMS Subject Area as appropriate to ensure consistency with the program element requirements of CRD Paragraph 2.a of Order 420.2D. Update the Listing of Accelerators at ORNL to include the Beam Test Facility and to reference the current listing of RGDs accelerator devices. 		
ACTS Number	26063.1.4 and 26063.1.5	Commitment Date: August 31, 2023	

Table 2. 420.2D CRDPROGRAM ELEMENTS

Status Of Compliance: Not Fully Implemented

² DOE O 420.2D, Safety of Accelerators Implementation Plan, November 25, 2022.

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Requirements: Paragraph 2.b

Contractors that manage accelerators that operate above 10 MeV must establish the following program elements, in addition to the elements listed in section 2.a.(2) and 2.a.(3) of this CRD, prior to commissioning and routine operations: (1) A Safety Assessment Document (SAD) in lieu of the analysis required in 2.a.(1) above; (2) A DOE approved A accelerator Safety Envelope (ASE):

(2) A DOE approved Accelerator Safety Envelope (ASE);

(3) A DOE approved Unreviewed Safety Issue (USI) Process; and

(4) An Accelerator Readiness Review (ARR) process.

Current Status	SNS is the only accelerator at ORNL that operates above 10 MeV. The SBMS <i>Accelerator Safety</i> Subject Area presently addresses all of the program elements listed in the requirement above; however, language in the SBMS will need to be revised to specifically align with the language of O 420.2D. SNS is presently compliant with the DOE O 420.2D requirement above. The BTF and RGD accelerator devices at ORNL operate below 10 MeV; therefore, the requirements above do not apply to these devices.	
Action required to implement	• Revise the Accelerator Safety SBMS Subject Area to implement the program element requirements of CRD Paragraph 2.b of Order 420.2D.	
ACTS#	26063.1.6	Commitment Date August 31, 2023

Table 2. 420.2D CRD PROGRAM ELEMENTS

Status Of Compliance: Not Fully Implemented

Requirements: Paragraph 2.c

Program elements must be periodically (interval not to exceed five years) reviewed and updated, as appropriate. The contractor must ensure the Contractor Assurance System includes processes to review the contractor accelerator safety program elements listed in this CRD.

Current Status	The current Accelerator Safety SBMS Subject Area for periodic reviews. The Accelerator Safety SBMS the 420.2D requirements for periodic review and upo The current Contractor Assurance System (CAS) inc directives; however, it does not specifically address reviews. The provisions of the CAS will need to be r reviews required by DOE O 420.2D are in place. If r to ensure compliance with the 420.2D requirements.	Subject Area will need to be revised to capture late of accelerator program elements. hudes processes to ensure compliance with DOE the specific 420.2D requirement for periodic eviewed to ensure processes are in place to ensure necessary, CAS processes may need to be revised
Action required to implement	 Revise the SBMS Accelerator Safety Subject Area to implement the specific requirements of CRD Paragraph 2.c of DOE Order 420.2D. Review the provisions of the Contractor Assurance System (CAS) and revise if necessary to ensure the CAS includes processes to review the contractor accelerator safety program elements listed in this CRD. 	
ACTS Number	26063.1.7	Commitment Date: August 31, 2023

Implementation Plan Actions for DOE O 420.2D Safety of Accelerators, Revision 1 of Table 2,

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Table 2. 420.2D CRD	Status Of Compliance: Not Fully Implemented
PROGRAM ELEMENTS	to a main provide a record of a second scale of the

Requirements: Paragraph 2.d, Accelerator Safety Envelope (ASE)

(1) The ASE, and any updates or amendments to the approved ASE, must be submitted to the DOE Field Element Manager for approval.

(2) Any activity violating the ASE must be terminated immediately and be put in a safe and stable configuration. Affected operations must be terminated immediately and put in a safe and stable configuration for discovered conditions that create or reveal an ASE violation. The DOE Field Element Manager must approve the restart of any activity or affected operations after a DOE-mandated shut down because of an ASE violation.

Current Status	Subject Area currently contains a Pro Envelope consistent with the requirem	0.2D requirements above. The existing Accelerator Safety SBMS occdure entitled Develop and Maintain Accelerator Safety nents of the previous order (DOE O 420.2C). The Accelerator to be revised to directly correspond to the verbiage of the 420.2D
Action required to implement	Revise the Accelerator Safety SI CRD Paragraph 2.d of Order 420	BMS Subject Area to implement the specific requirements of 0.2D.
ACTS Number	26063.1.8	Commitment Date: August 31, 2023

Table 2. 420.2D CRD Status Of Compliance: Not Fully Implemented PROGRAM ELEMENTS Status Of Compliance: Not Fully Implemented

Requirements: Paragraph 2.e, Safety Assessment Document (SAD)

The purpose of the SAD is to provide a description of the facility, an analysis of accelerator-specific safety hazards, and necessary controls to eliminate or mitigate those hazards such that associated risks are clearly understood. All hazards at an accelerator fall within two categories: 1) hazards that are safely managed by other DOE-approved applicable safety and health programs and/or processes; or 2) accelerator-specific hazards that are analyzed and safely managed by the SAD and provisions of the ASE. The amount of detail provided, and the depth of analysis must be tailored to be commensurate with the magnitude and types of hazards present and the complexity of the facility. The SAD, which represents the technical basis for the bounding conditions and controls in the ASE, must be maintained so it reflects current hazards and controls. The contractor must notify the DOE Field Element Manager, or designee when the SAD is revised and approved. The SAD must:

(1) Identify and analyze accelerator-specific hazards and identify necessary controls to eliminate or mitigate hazards to workers, the public, and the environment. Identify and analyze non-accelerator-specific hazards which could serve as initiators or contributors to other evaluated accelerator accidents. Hazards from radiation and residual radioactivity associated with beam operations must be evaluated for onsite and offsite impacts from routine operations and credible accidents as appropriate. Analysis of radioactive material must consider direct radiation, contamination, and airborne dispersion as appropriate;

(2) Provide a description of uncontrolled risk (i.e., without mitigation) and risk with controls in place associated with accelerators and their operations;

(3) Provide detailed descriptions of engineered controls (e.g., interlocks and physical barriers) and administrative measures (e.g., training, procedures) taken to eliminate or mitigate hazards to workers, the public, and the environment from accelerators and their operations;

(4) Include or reference a description of the accelerator and accelerator facility function, location, and management organization in addition to details of major accelerator and accelerator facility components and their operation

Current Status	SNS Safety Assessment Documents are fully compliant with the 420.2D requirement above. The existing <i>Accelerator Safety</i> SBMS Subject Area currently contains a Procedure entitled <i>Develop and Maintain Safety Assessment Document</i> consistent with the requirements of the previous DOE O 420.2C. This Procedure will need to be revised to reflect the verbiage of newly issued 420.2D.	
Action required to implement	• Revise the SBMS Accelerator Safety Subject Area to implement the specific requirements of Paragraph 2.e of DOE Order 420.2D.	
ACTS Number	<u>26063.1.9</u>	Commitment Date: August 31, 2023

Table 2. 420.2D CRD PROGRAM ELEMENTS	Status Of Compliance: Not Fully Implemented

Requirements: Paragraph 2.f, Unreviewed Safety Issue (USI) Process

The contractor must document how the USI Process is implemented and must identify how the requirements listed below are addressed. The site or facility USI Process must be submitted to the DOE. Field Element Manager for approval.

(1) The USI Process must evaluate proposed activities or discovered conditions that introduce new or previously unreviewed accelerator-specific hazards to ensure controls are in place to prevent or mitigate hazards as appropriate. The term "activities" includes modifications, temporary changes, permanent changes, and new activities.

(2) The USI Process must evaluate USIs to determine if accelerator-specific hazards associated with a proposed activity or discovered condition are adequately addressed by the current SAD and approved ASE. Any activity expected to exceed the bounding conditions of the ASE must be evaluated using the USI process. Once a USI has been appropriately reviewed, the issue becomes a Reviewed Safety Issue and may be considered as an addendum to the SAD.

(3) DOE approval is required if the USI Process determines that a Reviewed Safety Issue introduces accelerator-specific hazards that are not adequately addressed by the current SAD and approved ASE prior to implementation of the proposed activity.

(4) DOE must be promptly notified upon discovery of conditions with the credible potential to introduce acceleratorspecific hazards that are not adequately addressed by the current SAD and approved ASE.

(5) If conditions are discovered that introduce accelerator-specific hazards that are not adequately addressed by the current SAD and approved ASE, impacted/affected operations must be suspended immediately and put in a safe and stable configuration. Discovered conditions must be addressed using DOE-approved measures, as appropriate. DOE must provide written approval for the resumption of impacted/affected operations.

Current Status	The existing Accelerator Safety SBMS Subject Area currently contains a Procedure entitled Document Unreviewed Safety Issue Process that implements the requirements of the previous order (O 420.2C). The current procedure does not align with the new approach specified in DOE O 420.2D and does not require DOE approval as specified in DOE O 420.2D.
	The Accelerator Safety SBMS Subject Area will need to be revised to implement the new approach to the USI Process promulgated in DOE O 420.2D. Additionally, the Accelerator Safety SBMS

Implementation Plan Actions for DOE O 420.2D Safety of Accelerators, Revision 1 of Table 2,

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	Subject Area will need to be revised to address the requirement for DOE approval of the site USI Process.	
Action required to implement	 Revise the Accelerator Safety SBMS Subject Area to implement the specific requirements of CRD Paragraph 2.f of DOE O 420.2D. Submit the revised Accelerator Safety SBMS USI Process description Procedure to the DOE Oak Ridge Site Office for approval. 	
ACTS Number	26063.1.10	Commitment Date: December 15, 2023

Table 2. 420.2D CRD PROGRAM ELEMENTS

Status Of Compliance: Not Fully Implemented

Requirements: Paragraph 2.g, Accelerator Readiness Reviews (ARRs)

ARRs must be performed before DOE approval for commissioning and/or routine operation and as directed by the DOE Program Secretarial Officer, NNSA CSO1 for Safety, or a DOE Field Element Manager. A single ARR may be conducted prior to commissioning that addresses both commissioning and routine operations, with the agreement of the DOE Field Element Manager. As part of the ARR process, the contractor must demonstrate to the satisfaction of the DOE Field Element Manager that an appropriately comprehensive and independent ARR has been conducted, identified pre-start issues have been resolved, commissioning activities required for safe operations have been completed as appropriate, and the following processes are in place:

(1) A Contractor Assurance System that maintains an internal assessment process;

(2) A Configuration Management Program that addresses accelerator safety; and

(3) Credited controls and appropriate administrative processes related to accelerator safety (e.g., training, procedures, etc.).

The contractor must receive DOE Field Element Manager approval for:

(4) The start of commissioning activities; and

(5) The start of routine operations.

Current Status	The current approach to performing ARRs at SNS is compliant with DOE O 420.2D requirements; however, the SBMS Procedure <i>Perform Accelerator Readiness Reviews</i> should be revised to directly address the above requirements using consistent verbiage with that of DOE O 420.2D.	
Action required to implement	• Revise the Accelerator Safety SBMS Subject Area to implement the specific requirements of CRD Paragraph 2.g of DOE O 420.2D.	
ACTS Number	26063.1.11	Commitment Date: August 31, 2023

Implementation Plan Actions for DOE 0 420.2D Safety of Accelerators, Revision 1 of Table 2, Page 8 of 8

Contractors who manage acc approval prior to the start of			
approval prior to the start of		a second s	
Current Status Decor	Contractors who manage accelerators and their operations under this CRD must receive DOE Field Element Manager approval prior to the start of accelerator decommissioning activities.		
Area.	Decommissioning of accelerators in not addressed in the current Accelerator Safety SBMS Subject Area.		
	The SBMS Accelerator Safety Subject Area will need to be revised to implement the requirement for DOE Field Element Manager approval prior to the start of accelerator decommissioning.		
implement "accel Eleme dispos	ASSUMPTION – Disposal and disposition of RGDs that meet the DOE O 420.2D definition of "accelerator" will not be considered decommissioning and therefore does not require DOE Field Element Manager approval as specified in CRD Paragraph 2.h of DOE O 420.2D. Disposal and disposition of such devices will continue to be conducted in accordance with existing ORNL processes.		
	• Update the Accelerator Safety SBMS Subject Area to implement the specific requirements of CRD Paragraph 2.h of DOE O 420.2D.		
ACTS Number 26063		Commitment Date: August 31, 2023	

Table 2. 420.2D CR	-	· ·
Close Out Action	• Verify that all action items in the Implementation Plan for DOE Order 420.2D, Safety of Accelerators have been successfully completed.	
ACTS Number	<u>26063.1.13</u>	Commitment Date: December 15, 2023