INL/EXT-17-42207
Revision 0

Final Report for the Contractor Readiness Assessment of the Transient Reactor Test Facility Resumption of Transient Testing Activity at the Idaho National Laboratory

Frank McCoy

June 2017

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operated by Battelle Energy Alliance

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http://www.inl.gov

Prepared for the
U.S. Department of Energy
Office of Nuclear Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

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Executive Summary

A Contractor Readiness Assessment (CRA) was conducted June 5-16, 2017 at the Idaho National Laboratory (INL) Transient Reactor Test (TREAT) facility in order to verify readiness for the restart of the TREAT transient testing activity. The TREAT transient testing activity involves the restart and operation of the TREAT reactor – specifically the operation of the TREAT reactor in all modes, Fuel Handling Cask (FHC) operations, TREAT Loop Handling Cask (TLHC) operations, and the conduct of in-core experiments. The activity also includes the experiment safety controls and safety analysis aspects of the Experiment Safety Analysis Package for conduct of in core experiments.

The CRA addressed safety-significant structures, systems, and components (SSCs); operations and operations support personnel and procedures; and safety management programs (SMPs) germane to transient testing activity. The CRA provided the Battelle Energy Alliance, LLC (BEA) and the Department of Energy (DOE) Idaho Operations Office (DOE-ID) Startup Authorization Authority (SAA) with an independent assessment of TREAT's readiness to restart the transient testing activity and safely conduct operations.

The CRA was conducted in accordance with the approved Plan of Action (POA), INL PLN-5146, "Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity", and Implementation Plan, "Contractor Readiness Assessment Implementation Plan for the TREAT Resumption of Transient Testing Activity at the Idaho National Laboratory, Revision 3, dated June 7, 2016.

The CRA team was led by Mr. Frank McCoy of AECOM Nuclear and Environment (N&E) Technical Services. Fifteen other team members and/or Subject Matter Experts (SMEs) were selected by the team leader based on their relevant experience in management, nuclear operations, engineering, nuclear safety, quality assurance and safety management program expertise in their assigned areas of review and freedom from conflict of interest in their assigned review area. Team members conducted their reviews, inspections, interviews, and observations in accordance with the nineteen review objectives and criteria and review approach documents (CRADs) of the Implementation Plan.

During the course of the review more than 600 documents were reviewed, more than 70 personnel were interviewed, and about 50 observations of evolutions – including plans of the day, shift briefs, pre-job briefings, critiques, management meetings and briefings, work planning meetings and walk-downs, work performance, in-plant demonstrations, operational and emergency drills, and facility and equipment walk-downs – were conducted. The results of the team's evaluations were documented on Assessment Documentation Forms (Form 1s) associated with each of the nineteen review objectives and CRADs.

The CRA team determined that all 19 review objectives were met and identified two Pre-Start Findings and three Post-Start Findings – delineated in Tables ES1 and ES2 respectively. The CRA team concluded, pending satisfactory resolution of the two Pre-Start Findings, that the TREAT transient testing activity can be safely restarted and operations can be safely performed.

Table ES1, List of Pre-Start Finding

Finding Number	Description
MG3-PRE-1	Contrary to INL PLN-5146, "Contractor Readiness Assessment Plan Of Action for the Treat Restart of Transient Testing Activity" the TREAT Restart Plan does not address the timing or approval(s) needed to remove installed poison assemblies from the reactor, nor does it provide direction for management/SSW oversight of associated work evolutions.
OPS-PRE-1	Contrary to the requirements of DOE O 422.1 and LWP-9600, two separate instances were identified where independent verifications were not identified in the procedures nor performed relating to Reactor Trip Systems settings and calculations performed for determining reactor Heat Balance Power Level and nuclear instrument voltage settings.

Table ES2, List of Post-Start Findings

Finding Number	Description
EP1-POST-1	Contrary to DOE O 151.1C Attachment 2 and EPI-64, The INL Fire Department did not implement an effective incident command, as required by EPI-64 "Incident Command on the INL" Rev 11, at the event scene of the 6-13-17 drill. This is contrary to DOE Order 151.1C Attachment 2 which states "Contractors must develop and implement a Comprehensive Emergency Management System designed to protect the health and safety of all workers and the public from hazards associated with DOE/NNSA operations and those associated with decontamination, decommissioning, and environmental restoration;"
FP1-POST-1	Contrary to the requirements established in DOE-STD-1066-2012, NFPA 801, PRD-14401, and MCP-14401, the TREAT Facility Fire Hazard Analysis for the MFC-720 Complex does not present a comprehensive assessment of the fire hazards present in the TREAT MFC-720 Complex.
RP1-POST-1	Contrary to 10 C.F.R. § 835.401(b)(2), the Canberra iCAM air monitoring CAMS are not capable of measuring energies of radiation expected.

ACRONYMS

BEA	Battelle Energy Alliance, LLC
CM	Configuration Management
CPA	Core Physics Analysis
CRA	contractor readiness assessment
CRAD	criteria and review approach document
DOE	Department of Energy
DOE-ID	DOE Idaho Operations Field Office
EJ	Engineering job
ESA	Experiment Safety Analysis
FHA	Fire Hazards Analysis
FHC	fuel handling cask
FPE	Fire Protection Engineer
FSAR	Final Safety Analysis Report
I&C	Instrument and Control
INL	Idaho National Laboratory
IP	implementation plan
ISM	integrated safety management
ISMS	integrated safety management system
MAR	Material at risk
MFC	Materials Fuel Complex
MSA	Management Self-Assessment
N&E	Nuclear & Engineering
NFPA	National Fire Protection Association
NSR-AR	Non-Safety Related Augmented Requirements
O	Order
OSH	Occupational Safety and Health
OTP	Operations Test Plan
PMJ	preventive maintenance justification
POA	Plan of Action
R2A2s	Roles Responsibilities Authorities and Accountabilities
RA	Readiness Assessment
SER	Safety Evaluation Report

SME	subject matter expert
SMP	safety management program
SR	Safety related
SSCs	structures, systems, and components
STD	standard
TLHC	TREAT loop handling cask
TREAT	Transient Reactor Test Facility
TS	Technical Specifications
UPS	uninterruptable power supply
USQ	Unreviewed safety question

1. Introduction

1.1 Introduction and Background

The TREAT reactor achieved initial criticality on February 23, 1959 and operated for 35 years to support transient testing of nuclear reactor fuels and materials. TREAT was placed in standby in 1994. The TREAT reactor remained fully fueled, with an active safety basis and certified and qualified operations personnel. Activities remained authorized as indicated below:

- 1989 – 1994: All activities for reactor operations, transient testing, and shutdown conditions were authorized. The safety basis was constituted by the facility safety analysis report (FSAR) revisions 0 – 2 (formatted to Regulatory Guide 1.70) and technical specifications (TS) revisions 0 – 7 (approved by DOE through a safety evaluation report [SER] on March 10, 1989). Operations personnel certifications and qualifications were maintained.
- 1994 – 2014: The reactor was shut down and fully fueled. In-core fuel movement was prohibited after 2003. Shutdown reactor and nonreactor activities were authorized and included:
  - Routine corrective and preventative maintenance activities.
  - Technical specification surveillance activities.
  - Research and development and experimental activities involving movement and use of radioactive material including movement of nuclear fuel in storage.

  The FSAR and TS were maintained active during this period with the FSAR updated with revisions 3 – 7 and TS updated with revisions 8 – 12. The FSAR and TS were modified to isolate the control rod drives electrically. Operations personnel certifications and qualifications were maintained.
- 2014 – 2017: The reactor was maintained in a shutdown fully fueled condition. An outage to conduct recovery actions for restoring operations capability was conducted. The FSAR and TS were maintained active. The FSAR was updated with revision 8 and TS updated with revision 13, and both were modified to reconnect control rod drives electrically; coincident with installation of boron poison rods to increase shutdown margin. These were approved by DOE through the SER Addendum, dated September 2014. An FSAR and TS general content update was completed and implemented in 2016. In 2015, a CRA and DOE readiness assessment (RA) were conducted for movement of control rod drives and fuel in the core and these activities were also authorized in addition to those authorized in the 1994 – 2014 time frame. Operations personnel certifications and qualifications were maintained.
- 2017: BEA is planning to request and receive DOE approval to perform reactor critical operations and conduct experiments in the operating reactor in 2017. The approval will require satisfactory completion of this CRA and a DOE RA and resolution of any associated Pre-Start Findings.

The TREAT restart of transient testing activity is designated a restart after an extended period of no operations. The hazard categorization for both the TREAT facility and the restart of transient testing activity is hazard category 2. This categorization, documented in LST-715, *INL Nuclear Facility*, is based on fissile material inventory and the potential for criticality. The TREAT reactor was placed in standby in 1994 due to a lack of funding for program work. As described above, the reactor remained fueled and the safety basis remained in effect. During the nonoperation period, repair, and refurbishment of TREAT systems were completed to restore TREAT to operational capability.

Significant repairs included the replacement of control rod shock absorbers, Instrument and Control (I&C) upgrades, heating/ventilation/air conditioning refurbishment, demolition of the plasma hearth

process confinement enclosure, and replacement of the plant air compressors. None of these repairs and refurbishments resulted in changes to the original function of the systems or change in the design bases. Ninety-five engineering jobs (EJs) were initiated for the restart of transient testing activity. These EJs, typically replaced obsolete system components with functionally equivalent modem components, and included replacing the uninterruptable power supply (UPS) system, replacing the halon fire suppression system with a clean agent system, replacing high bay smoke detectors with a video detection system, and replacing the ARCS computer system hard drives. The EJs did not drive changes to the TREAT FSAR and TS. The FSAR and TS have been revised to meet current expectations, and descriptive changes caused by the EJs have been included in the FSAR. No significant additional changes are anticipated following restart.

Actions to support the restart of transient testing activity included reactor and support system condition assessments, initial testing, corrective and preventive maintenance, refurbishment, and functional testing. A revised FSAR SAR-420, *Transient Reactor Test Facility (TREAT) Final Safety Analysis Report*, and TS-420, *Technical Specifications for the TREAT Facility*, have been prepared and fully implemented. The training and qualification program has been enhanced to include the training and provisional qualifications/certifications necessary to support restart operations. TREAT procedures to support the new activities have been rewritten to reflect current format and current requirements flow down, and to implement SAR-420/TS-420 requirements.

1.2 Facility Description

TREAT consists of the reactor building, MFC-720; an access guardhouse, MFC-722; an office building, MFC-721; and a remotely located control building, MFC-724. The TREAT reactor building and the TREAT warehouse are enclosed by a fence, with access controlled through the guardhouse. The TREAT reactor is an air cooled, graphite-moderated thermal reactor designed to perform transient testing of nuclear fuels and materials. The TREAT warehouse is not in the scope of this CRA.

The TREAT is divided into 27 systems identified in LST-900, *TREAT Systems and Document Numbering Information*:

1. Reactor Structure
2. Fuel Assemblies
3. Fuel Storage
4. Fuel Handling (Casks and Tools)
5. Compensation Rods and Associated Equipment
6. Control/Shutdown Rods and Associated Equipment
7. Transient Rods and Associated Equipment
8. Balance of Plant (Meteorological, Road Barricade, Site and/or TREAT Evacuation, Building lighting, Communications, Intercom/paging, Lightning Arrestor, Physical Security System, Security Lighting, Fence and Gates, Oxygen Monitoring System)
9. Reactor Filtration/Cooling System
10. Electrical Distribution System (Normal, Standby, UPS, and Grounding)
11. Data Acquisition System
12. Water Systems (circulating, domestic, service)
13. Grey Water (Industrial Liquid, Sanitary & Suspect Liquid)

14. Compressed Air (Plant, Instrument & Reactor SCRAM Air Systems)
15. Building Heating and Ventilation System
16. Radiation Monitoring System (Stack Monitoring, CAMS, and RAMS)
17. Fire Protection System (Alarms, Barriers and Fire Protection Water)
18. Hoisting & Rigging
19. Experiment Support System (Loop Handling Cask)
20. Building Structure (including doors)
21. Automatic Reactor Control System
22. Dedicated Information System
23. Manual Reactor Control System (including Control Rod Interlock System)
24. Reactor Trip System (including Seismic Trip System)
25. Information Technology (telephone internet connections, etc. for standard office services)
26. Hodoscope
27. Radiography Facility

1.3 Purpose and Scope of the CRA

The purpose of this CRA is to verify readiness for the TREAT restart of transient testing activity at the INL and inform the startup authorization authority decision-making for startup authorization by providing a deliberate and managed determination of the state of readiness preparation and determination of whether operations can be performed safely. The TREAT transient testing activity involves the restart and operation of the TREAT reactor – specifically the operation of the TREAT reactor in all modes, Fuel Handling Cask (FHC) operations, TREAT Loop Handling Cask (TLHC) operations, and the conduct of in-core experiments. The activity also includes the experiment safety controls and safety analysis aspects of the Experiment Safety Analysis Package for conduct of in core experiments.

Because the TREAT (including restart of transient testing activity) is a hazard category 2 nuclear facility and because reactor operation and transient testing activities were suspended for programmatic and funding reasons in excess of a year, DOE O 425.1D required that both a contractor and DOE RA be satisfactorily completed prior to startup of the TREAT and restart of transient testing activity. To this end, DOE directed that a CRA and federal RA be conducted.

Verification of readiness includes assuring that equipment operability, procedure viability, and personnel knowledge, skills, and performance are adequate for operations. It also includes confirmation that (1) the facility is in a state of readiness to safely conduct operations in accordance with the safety basis; and (2) the management control programs are in place to ensure safe operations can be sustained. This equates to mature implementation of the integrated safety management (ISM) in conjunction with implementation of the individual facility authorization basis. To this end, the CRA was conducted in accordance with DOE Order 425.1D, "Verification of Readiness to Start Up or Restart of Nuclear Facilities"; DOE Standard (STD)-3006-2010, "Planning and Conducting Readiness Reviews"; DOE-HDBK-3012-2015, “Team Leader’s Good Practices for Readiness Reviews”; INL Management Control Procedure, MCP-9902, “Verification of Readiness to Start Up or Restart Nuclear Facilities", INL PLN-5146, “Contractor Readiness Assessment Plan Of Action for the Treat Restart of Transient Testing Activity”, and the CRA Team Leader approved CRA Implementation Plan for the TREAT resumption of transient testing activity at INL – and encompassed all 14 Core Requirements of DOE Order 425.1D consistent with direction provided in the Plan of Action (POA).

As specified in the POA, the previously authorized activities for the facility and shut-down fueled reactor that were not changed in preparation for restart of transient testing were not included in this CRA scope. In this regard, the following TREAT systems were not in scope or were only partially in scope for this CRA as described below:

NOT IN SCOPE:

3. Fuel Storage
8. Balance of Plant –partial (Building lighting, communications, Intercom/paging, Lightning Arrestor, Physical Security System, Security Lighting, Fence and Gates, Oxygen Monitoring System)
11. Data Acquisition System
13. Grey Water (Industrial Liquid, Sanitary &Suspect Liquid)
15. Building Heating and Ventilation System
25. Information Technology (Telephone internet connections, etc. for standard office services)
26. Hodoscope

PARTIALLY IN SCOPE:

8. Balance of Plant – partial (Meteorological, Road Barricade, Site and/or TREAT Evacuation)
10. Electrical Distribution System (Normal, Standby, UPS, and Grounding) (ongoing shutdown mode activity, this is only included to the extent that the electrical distribution system supports the operation of safety equipment)
17. Fire Protection System (Alarms, Barriers and Fire Protection Water) (ongoing shutdown mode activity, included only to the extent of oil mist mitigation/fire protection interaction, exemption for the high bay sprinklers, equivalency for hydraulic oil type, equivalency for basement occupant load, and new Novec systems for the Instrument and Control (I&C) room and control room)
18. Hoisting & Rigging (ongoing shutdown mode activity, included only to the extent that the system is related to TS controls, and the movement of shield blocks, fuel handling cask, and loop handling cask)
27. Radiography Facility (Experimental facility, included only to the extent of validation of the shutter and shielding functionality)

The POA specified the CRs (scope and breadth of the CORR) and identified the prerequisites and projected dates for performing the CRA and a DOE Federal Readiness Assessment (RA). The breadth of the CRA included all fourteen core requirements provided in DOE O 425.1D some of which were tailored to reflect the maturity of the INL requirements system and the complexity of the activity. The CRA Implementation Plan reflected the breadth of the CRA defined by the POA and further defined the depth of the CRA and accordingly this defined breadth and depth are reflected in the Criteria and Review Approach Documents (CRADS) and Assessment Documentation Forms (Form 1) delineated in Appendix 1 of this report. The CRA evaluation of prerequisite completion is also documented in the Form 1s of this report.

1.4 CRA Conduct and Team Composition

The CRA was a performance-based review conducted in accordance with the review objectives and CRADS included on the Form 1s delineated in Appendix 1 of this report, in order to verify readiness for the TREAT restart of transient testing activity at the INL.

The reviews conducted by each team member and subject matter expert (SME) were in accordance with the CRADs, which were grouped into functional areas by the CRA team leader. Each functional area CRAD addressed one or more core requirements and contained specific criteria upon which CRA team members objectively verified core requirement adequacy and the readiness of systems, processes, personnel, and management programs to restart and operate the TREAT reactor and conduct TREAT transient test activity safely. The CRADS provided evaluation criteria for various functional areas and a proposed approach (e.g., interviews, document reviews, and observations) for effectively evaluating readiness to restart the TREAT transient test activity.

CRA team members and SMEs reviewed more than 600 documents, conducted more than 70 personnel interviews, and observed about 50 evolutions, including plans of the day, shift briefs, pre-job briefings, critiques, management meetings and briefings, work planning meetings and walk-downs, work performance, in-plant demonstrations, operational and emergency drills, and facility and equipment walk-downs. These reviews, interviews, and observations were conducted in accordance with the CRADS to ascertain the extent to which the TS and specified SMPs were safely and effectively implemented. These reviews, interviews, and observations also included evaluation of the proficiency of personnel; operability and configuration management of equipment important to safety; and determination of the extent to which personnel, equipment, and procedure preparations were sufficient to assure safe and effective operation. The results of the team's evaluations associated with each of the CRADs were documented in the Appendix 1Form 1s.

The CRA team was led by Mr. Frank McCoy of AECOM Technical Services. Fifteen other team members were selected by the team leader based on their relevant experience in management, nuclear and reactor operations, engineering, nuclear safety, quality assurance and safety management; expertise in their assigned areas of review; and freedom from conflict of interest in their assigned review area. Biographical information regarding the team leader and team members is provided in Appendix 2.

The CRA team, associated roles, responsibilities, and interfaces, and assessment objectives and CRADs were organized and assigned as described in the IP and in Table 1 below.

Table 1 CRA Team Assignments

NAME	FUNCTIONAL AREA	CRAD
Frank McCoy	Team Leader	
Jason Andrus	Criticality Safety	CS1
Joe Biggerstaff	Environment Safety & Health	ESH1, ESH2
Brooks Clements	Operations	OPS1, PM1
Allan Coutts	Fire Protection	FP1
Sam Glenn	Management	MG1, MG2, MG3, MG5
Forest Holmes	Emergency Preparedness	EP1
Dwight Kraai	Operations / Training & Qualification	OPS1, TQ1
Jerry Kurtz	Radiation Protection	RP1
Chip Lagdon	Configuration Management / Engineering	CM1
Russ Leavitt	Waste Management	WM1
Jeff Lietzow	Operations / Procedures Management	OPS1, PM1
Anne McCartin	Nuclear Safety	MG4, SB1
Alan Trost	Quality Assurance	MG5, QA
Rick Runnels	Maintenance / Surveillance Testing	MTI1
Tony Wilson	Maintenance / Surveillance Testing	MTI1

2. CRA Evaluation

2.1 Summary Results

The team identified over 200 items of interest during the course of the review which were discussed in the daily team meeting and captured on a daily issues log. These items of interest comprised questions, noteworthy practices, operational or procedural enhancements, issues and deficiencies, and opportunities for improvement. The majority of these items were issues and deficiencies needing evaluation for inclusion in the laboratory's issues management system or other resolution. The daily issues log was provided to TREAT management for such evaluation. Some deficiencies were specifically annotated in the report for emphasis. Five of the identified issues and deficiencies met criteria to be categorized as a Finding and two of these Findings met criteria to be classified pre-start. The remaining three Findings did not meet Pre-Start criteria and thus were classified Post-Start. The Criteria for categorization and classification of Findings are derived from DOE-HDBK-3012-2015, "Team Leader's Good Practices for Readiness Reviews" and are included in Table 2 below.

Table 2 Issue Categorization and Classification Criteria

Issue Categorization and Classification Criteria The Review Team used the following criteria to determine if an issue or deficiency constituted a Finding; and if a Finding should be classified Pre-Start or Post-Start.
A. Determination that a Finding Exists Is the identified condition a nonconformance with a stated requirement that represents either: (1) a systematic failure to establish or implement an adequate program or control; or (2) a significant failure that could result in an unacceptable impact on safety of personnel, the facility, the general public, or the environment during nuclear operations? If the answer is yes, it is a Finding. B. Pre-Start and Post-Start Determination 1. Does the loss of operability of the item prevent safe shutdown, or cause the loss of essential monitoring? 2. Does the loss of operability of the item require operator action in less than ten (10) minutes to prevent or mitigate the consequences of events described in the Safety Analysis? 3. Does the loss of operability of the item cause operation outside the Safety Analysis? 4. Does the loss of operability of the item result in a reduction of the margin of safety as described in the Safety Analysis? 5. Does the issue indicate a lack of control which can have a near term impact on the operability or functionality of safety related systems? 6. Does the issue involve a violation or potential violation of worker safety or environmental protection regulatory requirements that pose a significant danger to workers, the public, or of environmental insult or release? If the response to any of the above questions is yes, the item should be considered a Pre-Start Finding. Otherwise, the issue should be considered a Post-Start Finding; however, based on its significance and with approval by the Team Leader, the issue may still be classified as a Pre-Start Finding.

The two identified Pre-Start Findings are delineated in Table 3 and the three identified Post-Start Findings are delineated in Table 4.

Table 3 List of Pre-Start Findings

Finding Number	Description
MG3-PRE-1	Contrary to INL PLN-5146, "Contractor Readiness Assessment Plan Of Action for the Treat Restart of Transient Testing Activity" the TREAT Restart Plan does not address the timing or approval(s) needed to remove installed poison assemblies from the reactor, nor does it provide direction for management/SSW oversight of associated work evolutions.
OPS-PRE-1	Contrary to the requirements of DOE O 422.1 and LWP-9600, two separate instances were identified where independent verifications were not identified in the procedures nor performed relating to Reactor Trip Systems settings and calculations performed for determining reactor Heat Balance Power Level and nuclear instrument voltage settings.

Table 4 List of Post-Start Findings

Finding Number	Description
EP1-POST-1	Contrary to DOE O 151.1C Attachment 2 and EPI-64, The INL Fire Department did not implement an effective incident command, as required by EPI-64 "Incident Command on the INL" Rev 11, at the event scene of the 6-13-17 drill. This is contrary to DOE Order 151.1C Attachment 2 which states "Contractors must develop and implement a Comprehensive Emergency Management System designed to protect the health and safety of all workers and the public from hazards associated with DOE/NNSA operations and those associated with decontamination, decommissioning, and environmental restoration;"
FP1-POST-1	Contrary to the requirements established in DOE-STD-1066-2012, NFPA 801, PRD-14401, and MCP-14401, the TREAT Facility Fire Hazard Analysis for the MFC-720 Complex does not present a comprehensive assessment of the fire hazards present in the TREAT MFC-720 Complex.
RP1-POST-1	Contrary to 10 C.F.R. § 835.401(b)(2), the Canberra iCAM air monitoring CAMS are not capable of measuring energies of radiation expected.

Review results and conclusions of the CRADs summarized here are found in detail in the Assessment Documentation Forms of Appendix 1 to this Report. As identified below, the CRA Team determined that all 19 Assessment Objectives were met.

CM1: This objective was met. No findings were identified. Two noteworthy practices were identified relating to the establishment of a configuration coordinator and the development of the system readiness binders. Overall, the TREAT CM approach meets the DOE Standard for this Safety Management Program consistent with the hazards analysis of the TREAT Facility. Through the Laboratory Policy a formal approach is established that endorses the use of CM and the Facility has documented the process in its local procedures. Key roles and responsibilities are defined, as are the structures systems and components. Each system has an established CM plan that identifies interfaces and graded approach

application. Involved individuals are knowledgeable about the activities. The establishment of the CM coordinator position enables a built in verification of the processes to ensure appropriate application. One issue was noted with the documentation of the internal reactor components that was resolved during the review.

CS1: The objective was met. No findings were identified. One Noteworthy Practice and five deficiencies were identified. A thorough review and evaluation of the criticality safety hazards for TREAT operations appears to have been performed in a manner consistent with expectations from the company program. However, lack of rigor in documentation as well as inconsistencies between written procedures, verbal expectations and understanding based upon discussions requires additional written clarity to establish clear and consistent expectations.

EP1: The objective was met. One Post-Start finding was identified. Twenty issues were identified for evaluation and resolution in the LabWay issues management system. Two (2) noteworthy practices were identified. Notwithstanding the number of identified issues, the emergency preparedness program implemented in support of the TREAT facility is adequate. Program improvements identified will further strengthen and improve the effectiveness of the program as required by DOE Order 151.1C.

ESH1: The objective was met. No Findings were identified. One Noteworthy Practice was identified. Personnel at TREAT exhibit knowledge and awareness of public and worker safety and health as well as environmental protection requirements. Their actions through observance of pre-job briefings, field execution of work, document reviews, and interviews indicate a high priority to comply with the requirements. Sufficient safety and health programs and procedures are in place at TREAT as determined by the CRA team.

ESH2: This objective was met. No findings or noteworthy practices were identified. Worker safety and health requirements of 10 CFR Part 851 “Worker Safety and Health Programs” have been implemented at TREAT. LRD-14700, “Workers Safety and Health Program Requirements” are embedded with 10 CFR 851 required elements. LRD-14700 includes an implementation matrix that flow-down the requirements to ensure compliance with the governing regulations. Worker safety and health aspects are incorporated into the activity level through the integrated work management process where work scope is defined, the hazards and controls identified, and mitigating processes implemented. Current SMP implementation of the Health and Safety program established at TREAT supports safe accomplishment of reactor restart and continued operations, while protecting employees, the public, and environment from negative impacts. Reviews of current staffing levels, observations during field activities and interviews with Operations and Occupational Safety and Health (OSH) management support that an adequate number of qualified personnel are available to ensure safe operations and implement the Worker Safety and Health Program. OSH staff are knowledgeable of the TREAT processes and have the technical skills to recognize, analyze, and implement controls to protect the workers. Interviews were conducted concerning roles and responsibilities for TREAT restart and continued operations as well as fundamental discipline knowledge, TREAT specific procedures, and hazard identification and incorporation into procedures and activity work control documents. OSH personnel understood their role in the protection of workers as did Operations management taking overall ownership of the program. Adequate procedures, facilities, and equipment are available to ensure the Worker Safety and Health Programs are sufficient. Walk-downs and visual observations throughout the facility indicate housekeeping is above average and systems are well maintained.

FP1: The objective was met. One Post-Start Finding was identified. Two deficiencies and one Noteworthy Practice were identified. Implementing procedures are in place to ensure consistent execution of the fire protection SMP and the TREAT facility staff is proactively executing the implementing procedures. While repairs can be made to the fire barriers, the needed changes are consistent with older DOE facilities and an active project is addressing these weaknesses. There is an approved and

implemented Fire Hazards Analysis for the TREAT facility; unfortunately there are multiple noncompliances in the document. This condition is considered to be a Finding because of the multiple analysis gaps. The Finding was judged Post-Start based on the gaps being addressed in the DSA or other supporting documents and no significant safety risks existed. The resumption of transient reactor operations introduces a unique hazard that requires update to Fire Department planning documents and the TREAT emergency plans. Changes will be necessary to improve the safety of emergency responders while TREAT is in a Transient Mode; this topic is considered a deficiency. In addition, tabletop exercises, or similar methods, should be used to demonstrate that applicable procedures are consistent and can be successfully executed during transient operations. A recent physical change, the addition of hasps on several doors to support reentry following a reactor transient, creates a non-compliance with NFPA 101:7.2.1.5.1. Controls will need to be established to assure means of egress are maintained when the building is occupied. While this deficiency represents a weakness in the SMP, the CRA Team concluded that line management has implemented the FP SMP and is working to strengthen the SMP as weakness are identified.

MG1: This objective was met. There were no findings, deficiencies, or noteworthy practices identified. TREAT line management has established and implemented SMPs to ensure safe accomplishment of work and implementation of the approved safety basis. The level of knowledge of managers and staff is adequate based on review of records, interviews, and observation of operational demonstrations. Senior Management presence is evident in the field, and their expectations for safety are clearly understood and evident in the workforce. Processes are in place to periodically assess the effectiveness of SMPs and make corrections if necessary.

MG2: This objective was met. There were no findings, deficiencies, or noteworthy practices identified. Based on reviews of applicable programmatic and TREAT implementing procedures, interviews of TREAT line managers and staff, and observation of selected operations, and management meetings, the review team concluded this Objective has been met. TREAT Roles, Responsibilities, Authorities, and Accountabilities (R2A2s) (including those between the line operating organization and ESH&QA support organizations) are clearly defined, understood, and effectively implemented with line management responsibility for control of safety.

MG3: The objective was met. One Pre-Start Finding and one Deficiency were identified. No Noteworthy Practices were identified. A restart program has been developed that includes plans for graded operations to simultaneously confirm operability of equipment, the viability of procedures, and the performance and knowledge of the operators. The plan includes criteria for senior personnel to use while performing oversight. Criteria for discontinuing additional oversight are also included.

MG4: This objective was met. There were no findings or noteworthy practices identified. Formal agreements between BEA and DOE are established via the contract. A systematic review of the facility's conformance to the requirements described herein was performed. The review has determined that procedures have been prepared, reviewed, and approved within the framework of the INL requirements system, that a DOE approved SAR, TS, and SER (including COAs) and a safety basis implementation matrix are in place, and that fire exemptions and equivalencies have been approved and compensatory actions have been implemented.

MG5: This objective was met. There were no findings or deficiencies identified. One noteworthy practice was identified. An effective Contractor Assurance System has been established to identify, evaluate, and resolve deficiencies and recommendations made by contractor line management and independent contractor audit and assessment groups. Processes are in place at company and facility levels that provide for resolution of issues and recommendations by external review teams and audit organizations.

MTI1: This objective was met. No findings were identified. One noteworthy practice was identified. Line management has established an adequate Maintenance SMP (including Testing and In-Service-Inspection (ISI) to ensure safe accomplishment of work in support of resumption of TREAT operations. Asset Suite, the INL Computerized Maintenance Management System, is in place to confirm, recall surveillances and periodically reconfirm the condition and operability of Vital Safety Systems (VSS). Adequate facilities and equipment are available and adequate for safe facility operation and the material condition of all safety, process, and utility systems will support the safe conduct of work. This was confirmed through extensive document reviews and system walkdowns. The TREAT organization may want to consider establishing a satellite maintenance shop or work area that would be available when extended transient reactor operations preclude normal shop work. The level of knowledge of Maintenance, Test, and ISI managers and staff is adequate, training is current, and the comradery and ownership among the Technicians and Craft personnel is at a very high level.

OPS1: The objective was met. One Pre-Start Finding, two Noteworthy Practices and two deficiencies were identified. Based on observations of demonstrations of operating procedures, abnormal and emergency procedures, and review of documentation, the formality and discipline of operations are adequate to conduct work safely, and programs are in place to maintain this formality and discipline. The level of knowledge of operations personnel (including managers) is adequate based on reviews of records, selected interviews of operations managers and staff, and observations of operational demonstrations.

PM1: The objective was met. There were no findings, deficiencies, or noteworthy practices identified. Line management has established a Procedures Management SMP to ensure safe accomplishment of work and adequate and accurate procedures and safety limits are approved and in place for operating the TREAT facility process and utility systems. The level of knowledge of managers and staff responsible for administering and implementing procedures management is adequate. This conclusion was based on Procedure Management requirements being implemented through processes and procedures consistent with laboratory wide requirements, the satisfactory flow-down of requirements from the Safety Analysis Report and the Technical Specifications, adequate control mechanisms being in place to ensure that the latest revision to documents is utilized to control and perform work and activities, sufficient qualified staffing with acceptable knowledge levels of the procedure program and its implementing documents.

QA1: This objective was met. There were no findings or noteworthy practices identified. The TREAT Quality Assurance Program was evaluated through a combination of personnel interviews, document reviews, and observations, and found to be sufficiently implemented to support the TREAT Re-start activity. There are sufficient and compliant program documents, procedures, and processes in place, as determined by this review of the TREAT Quality Program implementation review. There are adequate personnel, facilities, and equipment to support quality program requirements based on interviews with Quality Assurance and Operations personnel. There were no issues related to the TREAT implementation of the Quality Assurance Program.

RP1: This objective was met. During the review, one finding, one deficiency, and three noteworthy practices were identified. The TREAT Radiological Control program effectively implements the INL Radiological Control program. Management, technical staff, and HPTs understand the operation of the facility and processes. Safety is integrated into radiological operations at all levels.

SB1: This objective was met. There were no findings identified and there was one Noteworthy Practice identified. Based on interviews conducted and a review of a sampling of procedures and facility records, the CRA team concludes that the facility SAR, TS, ESA, and OTP are in place and describe and protect the safety envelope of the facility and experiment operations. Nuclear safety and USQ procedures are in place to maintain the safety basis, and sufficient knowledgeable personnel are available to implement the program and support the facility.

TQ1: This objective was met. No findings were identified. One Noteworthy Practice was identified. A Training and Qualification Program is developed, documented, and approved, and it implements the requirements of DOE O 426.2, as documented in PDD-218 which combines a TPM and TIM. Requirements for operations and support personnel are established, and personnel are trained to these requirements. Managers are selected and trained in a manner that ensures competence commensurate with their responsibilities. TREAT has adequate numbers of qualified and knowledgeable training staff, as well as adequate facilities and equipment to support safe facility operations appropriately. TREAT management and staff were available and actively participated in demonstrating an exceptional level of knowledge in their areas of responsibility.

WM1: The objective regarding waste management has been met. There were no waste management findings. There were two deficiencies identified. There was one noteworthy practice identified. The objective of this assessment was to verify that TREAT line management has implemented a Waste Management (WM) SMP to ensure safe accomplishment of work and to verify that the level of knowledge of WM managers and staff is adequate based on review of examination results, interviews, and observation of operational demonstrations. TREAT follows the established INL waste management program. None of the deficiencies rose to the level of a finding. The identified deficiencies indicate an immaturity in implementing the established waste management program. As long as line management continues to emphasize regulatory and procedural compliance and WGS is integrated into operations these types of error will be avoided in the future.

2.2 Conclusion

The CRA team concluded, pending satisfactory resolution of the two Pre-Start Findings, that the TREAT transient testing activity can be safely restarted and operations can be safely performed.

3. Noteworthy Practices and Lessons Learned

Noteworthy Practices:

The following TREAT noteworthy practices were identified by the team:

- **CM1-NWP-1**: The designation of a Configuration Management Coordinator in the System Engineering Group helps improve the application of CM practices. It provides an internal verification step that improves the quality of the configuration management program.
- **CM1-NWP-2**: The development of the system readiness binders provides a systematic approach to readiness activities and a baseline to support restart. The information gathered from the walkdowns, system functional tests, calculations and system repairs will be useful in maintaining the plant to support future work and has assisted in training the current staff.
- **CS1-NWP-1**: Engagement from the Criticality Safety Engineering Organization with Criticality Safety Officers and facility management.
- **EP1-NWP-1**: The iMAPs display is a very good response tool in the MFC ECC. Once finalized with configuration management established and trained, it will enhance response capabilities.
- **EP1-NWP-2:** The Fire Cameras viewing capability is a very good asset in determining event scene impacts from a remote location. The ability to share this information via screen capture or access to the information in the MFC ECC should be on considered.
- **ESH1-NWP-1**: "Lightning Fast Safety Response Times" posters are deployed throughout the facility and serve as a good communication device to keep the workforce informed on the status of safety related items, immediate actions, and mitigation as well as the time required to have the issue resolved.
- **FP1-NWP-1**: The badge-based method to maintain entry limits when personnel must enter the basement is a noteworthy practice that fulfills the necessary controls to manage life safety risks.
- **MTI1-NWP-1**: As a normal part of LOTO establishment at TREAT a personalized DNO Tag (434.12A), complete with printed name and photo, is hung on the lock along with the standard LOTO DNO Tag at the point of lock-out. The personalized tag provides clear information regarding who has hung the lock and personalizes the LOTO by injecting a human element into what should be protected. This practice is implemented INL-wide.
- **MG5-NWP-1**: TREAT's implementation of the INL CAS is excellent and a Note Worthy Practice. The TREAT facility is operated and managed using the structure and processes that form the INL CAS and ISMS. Managers and staff are able to clearly explain their roles & responsibilities and how they contribute to the safe, effective operation of the facility.
- **OPS1-NWP-1**: The use of Operating Experience (OE) during pre-job briefs is a noteworthy practice. The OE selected was pertinent to the specific evolutions observed and helped to reinforce expectations of work performance.
- **OPS1-NWP-2**: During reactor operation demonstrations, the SRO conducted short briefings with the RO just prior to each power escalation or change in rod configuration. Each brief was an interactive discussion of indications that would be monitored, expected response, limits of rate of change of power escalation, and response to alarms or abnormal indications. These briefs were exemplary and are considered a noteworthy practice.
- **RP1-NWP-1**: Use of scrub clothing with mesh pockets to contain hanging items.
- **RP1-NWP-2**: Use of electronic radiological log keeping.

- **RP1-NWP-3**: Radiological Work Permit (RWP) cue card use.
- **SB1-NWP-1**: The TREAT-ESA-001 Table 1 summary of experiment safety analysis commitments, including the reference to the ESA section that derives the commitment, is identified as a Noteworthy Practice to facilitate communication of the commitments derived and the location of their Bases.
- **TQ1-NWP-1**: Qualification for the TREAT Control Technician (TCT) and Mechanics are based around "task qualifications". Each task has a task completion signature, a manager sign-off, and a Training Coordinator signature for input into TRAIN. A TRAIN report was created that allows the individuals and their management to see who is qualified to perform what tasks unsupervised. The methods used here could be implemented at many other nuclear facilities that employ task-based qualifications.
- **WM1-NWP-1**: TREAT was in the process of filling a couple metal waste boxes. An inventory was being kept for each item placed in the boxes. When questioned about the characterization, the operator was very knowledgeable about each item and was able to justify the characterization of each.

Lessons learned:

The review team identified the following lessons learned including execution problems and successes encountered during this review. These could be used by future teams to improve the readiness review process.

- **Flash Drive**: The flash drive was provided to the team well in advance of the review to facilitate preparation. The drive was populated with reference documents arranged by CRAD topic. The documents ranged from the INL wide procedures to site specific procedures, surveillances, engineering jobs, safety analysis, fire hazards analysis and other pertinent information. This enabled the team to come prepared and understand the document structure at TREAT. However, all team members should ensure they obtain the flash drive before the review at the earliest possible time.
- **Team Training**: The facility training and pre-visit (tour as part of training) permitted a basic facility understanding TREAT structures, systems and components; programs and processes, and personnel. This made the first few days of the CRA significantly more productive. The systems training, reactor operation training, DSA training, assessment training, and program overview provided a common understanding of the facility, hazards, operations approach, and CRA approach that helped the team.
- **Escorts**: The availability of escorts enabled the team to move about freely to complete their review scopes in a timely manner. Walk-downs and the ability to move in and out of the plant facilitated efficient conduct of the review.
- **Readiness Binders:** The system readiness binders provided a single point of information to enable the reviewers to understand what had been performed for each TREAT system in terms of inspections, system testing, repairs, operability, engineering jobs and associated drawings. This reduced the review time significantly.
- **CRA Team Daily Issues Log**: The CRA Team daily issues log process enabled clear communications and early identification of information needs early in the review. The responsiveness of TREAT personnel enabled issue timely information flow and issue clarification, resolution or discussion. The log also facilitated daily TREAT management briefs by the team leader.
- **Assessment Binders:** When another organization within a company conducts assessments of the facility under review, the reports of those company assessments also need to be included in the information available to the team in the assessment binders.

- **Printing**: While the printing arrangements for the team were responsive, it would have been helpful to have printing capability direct to the team. For example, the initial meeting instructions, contact lists, maps and other information couldn't be printed by the team. A package should be provided on the first day that includes that information in hard copy format. Access to the company network and printers is preferable, to include document access.
- **Drills & Exercises:** Expectations regarding the degree of drill execution, performance rigor and conduct of drills needs to be communicated prior to the Readiness Assessment. This could be added to the team training conducted prior to the review. Topics should include range of the drill, observers, roles & responsibilities, and exercise/drill objectives.
- **CRAD and Form 1 Format:** Several Form 1 formats were floated through the team. Only one needs to be provided and that should be addressed in the team training up front, prior to the review. The Form 1 templates should be provided to the team before the review begins. Deficiencies that do not rise to the level of a finding should not be tracked, but communicated in the normal write up of the CRAD. The individual responsible for compiling the report should attend daily team meetings.
- **Saturday Management Interviews:** The Saturday Integrated and Interactive Management Team interviews is a good practice. It provided the team with a good view of the teamwork among managers and minimized normal work day distractions. Including RP, QA, EM helped provide a sense of interaction with facility management that was viewed as very positive during this review. It would have been beneficial to have also included other key support mangers such as ESH. The duration of the management interview was helpful in seeing the management as a team. Having the facility managers explain how their CAS and ISMS are implemented quickly shows if they understand and use the system(s) or not. All review team members should be encouraged to at least attend and observe. The process provides excellent context for evaluating what team members see and hear while performing the rest of the assessment.
- **Administrative Support**: Having competent and responsive administrative support available to the CRA team helped to facilitate a successful review. The administrative support provided by the TREAT organization was outstanding.

APPENDIX 1

ASSESSMENT DOCUMENTATION FORMS

(FORM 1)

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Configuration Management

Functional Area:	Objective: CM1	OBJECTIVE MET	
Engineering	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

CM1: Line management has implemented a Configuration Management SMP to ensure safe accomplishment of work at the TREAT facility. The facility systems and procedures, as affected by facility modifications, are consistent with the description of the facility, procedures, accident analysis and assumptions included in the safety documentation. A formal program for modifying facility systems and procedures as applied to the project is adequate and implemented and authorized modifications within the scope of the Readiness Review have been completed and fully closed, or evaluated and determined not to affect the ability to safely start reactor operations. The level of knowledge of Engineering manager and staff responsible for Configuration Management is adequate.

CRITERIA

1. Configuration Management requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility in order to maintain control over facility design with emphasis on safety related systems.
2. TREAT facility processes and procedures for configuration management maintain control over facility design with emphasis on vital safety systems (including Safety Related (SR) and Non-Safety Related Augmented Requirements (NSR-AR) SSCs identified in SAR-420/TS-420). In this regard they ensure that design requirements, physical configuration, and associated documentation of the SSCs are controlled throughout the life of the facility, even as changes are made.
    - SSCs (including Vital Safety Systems and safety related design features) are defined and a formal program for modifying facility systems and procedures as applied to the project is adequate and implemented at the TREAT facility
    - A technical baseline is established and configuration control plan is implemented to control the technical baseline and changes thereto with emphasis on Vital Safety Systems and safety related design features.
    - A formal engineering change order (ECO) program is implemented to identify and control the issuance or modification of engineering design documents
    - A formal process is in place (e.g., the USQ process) to ensure that facility modifications are evaluated for impact to the safety basis, to ensure continued consistency between the facility's physical configuration, its procedures, and the safety basis.
    - A formal process is in place to ensure procedures have been revised in response to facility modifications and the Training Organization is notified of the modifications identified above by line management prior to completion of installation/operation

3. Functionality and readiness of TREAT SR and NSR-AR systems has been reestablished by functional testing; establishing/reestablishing configuration management including change control, change review and design basis reviews, as required; updating drawings, as required; updating System Design Description, as required; labeling; generating PMJs, as required; and identifying vital critical spares, as required consistent with SP-50.1.2, “Functionality Testing of TREAT systems and components”, and SP-50.1.6, “TREAT Systems Readiness Process”.
4. As affected by facility modification since the 1994 suspension of operation, TREAT procedures, drawings, and facility physical configuration, are consistent with the description of the facility, procedures, accident analysis and assumptions included in the safety basis documentation.
5. Authorized modifications within the scope of the CRA have been completed and fully closed, or evaluated and determined not to affect the ability to safely start reactor operations.
6. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that configuration management processes and procedures support safe facility operation with adequate services.
7. Sufficient qualified personnel are available to effectively implement the configuration management processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the configuration management processes and procedures is adequate based on review of records, interviews, and observation of operational demonstrations.
8. The applicable Cognizant System Engineers are engaged in the CM process and are knowledgeable when changes are being proposed or implemented.
9. Independent verification is implemented to verify adequacy of design products and these verifications are formally documented for items such as design inputs and constraints, accuracy of calculation, design outputs, system interactions, and assumptions are reasonable.
10. Assessments are periodically performed to verify the conditions of systems and equipment.
11. Prerequisites PR-6.3, PR-8.1, PR-8.2, PR-8.3, and PR-8.4 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review TREAT configuration management processes and procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with configuration management.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the engineering related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of configuration management at the TREAT facility. These include:

- Management and independent assessment of configuration management implementation and issues management documentation for issues identified through those assessments.

- Presentation material and other documents used to support senior management review of the "health" of configuration management implementation; including conclusions and assigned actions by senior management.
- MSA documentation associated with configuration management implementation.
- Status and documentation of all open and recently closed specific configuration management issues, corrective actions, and Lesson Learned.
- Staffing plan for configuration management support.
- The assessment program to ensure it includes reviews of system operability, reliability and material condition.
- The technical baseline program to ascertain that it is established and that a configuration control plan is implemented to control the technical baseline and changes thereto with emphasis on safety related systems.
- Documentation to assure that safety SSCs are defined in LST-900 with Quality level 2 designation.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing configuration management activities.

Review selected engineering and configuration management documents (Engineering and Configuration Management Manual and associated procedures, design documents, assessments, work packages, etc.) to ensure that the elements of system requirements, performance criteria, assessments, change control, work control and document control are specified and integrated. Ascertain the extent to which procedures are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.

Review selected completed and in-progress output documentation associated configuration management activities at the TREAT facility to evaluate the adequacy and completeness of the activity. These will include FSAR/TS and SER; modification documentation; procedure revision requests; Unreviewed Safety Question (USQ) determinations; design bases and system design descriptions (SDDs); essential , vendor, and as-built drawings; engineering, operations and maintenance procedures and records; quality assurance and control records; issue reports and nonconformance reports; equipment walk-down documentation; equipment labeling; etc.).

Interview selected personnel who are involved in performing, supervising, and reviewing configuration management activities at the TREAT facility – including Facility Manager; Operations Manager; Shift Operations Managers; Operators; Cognizant System Engineers; engineering and maintenance management and staff; nuclear safety management and staff; procedure writers; and quality assurance personnel. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level SMP procedures. Ascertain their level of knowledge and understanding of configuration management program activities at the TREAT facility; related controls and requirements and their implementation; role and responsibility interfaces with TREAT facility operation; and the acceptability of configuration management practices and behaviors.

Observe configuration management related meetings, pre job briefings and work in the field to validate configuration management activities are being conducted safely and in a manner that will support and sustain TREAT facility operations. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Conduct facility walk-downs of selected accessible SSCs to evaluate consistency of procedures and drawings, facility physical configuration, and safety basis and completion of authorized modifications.

Confirm the adequacy and completeness of facility modification and configuration management activities.

Confirm the consistency of the facility system installed physical configuration, drawings, and procedures with the description of the facility, procedures, accident analysis and assumptions included in the safety documentation.

Confirm that procedures and drawings, and facility system installed physical configuration are consistent and procedures have been revised in response to facility modifications.

Confirm authorized modifications have been completed and fully closed, or evaluated and determined not to affect the ability to safely start nuclear operations and accepted by management.

Confirm sufficient configuration management staffing and equipment are available to support TREAT facility operations.

Confirm procedures and work documents that implement configuration management requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements.

Confirm that the knowledge of the configuration management engineers and managers is adequate.

Reviewer: Chip Lagdon

Records Reviewed

- PLN 4797 Rev 0, "TREAT Configuration Management Program Implementation Plan," 10/01/14
- SP-50.3.1.1, "TREAT Equipment Labeling Implementation," Rev 1, 10/11/16
- "List of Equipment Hierarchy Standard", LST-60, Rev 2, 06/03/08
- LST-900, "TREAT Systems and Document Numbering Information," Rev 8, 05/16/17
- PDD-10000, Rev 2, "INL Program Description Document, Conduct of Engineering," 04/30/12
- LWP-10000, Rev 2, "INL Engineering Initiation," 10/30/14
- LWP-10106, Rev 3, "INL Engineering Verification," 10/20/2014
- LWP-10500, Rev 8, "INL Managing the Configuration of Structures, Systems and Components," 02/13/17
- LWP-10501, Rev 2, "INL Engineering Change Control," 05/24/13
- PDD-10502, Rev 3, "INL Configuration Management Program," 09/30/13
- LWP-10600, Rev 4, "INL System Engineering," 10/30/13
- SD-49.4.0, Rev 0, "INL TREAT Drawing-Type Designation Criteria," 03/25/15
- SP-30.1.2, Rev 0, "MFC and TREAT Facility Modification Control," 06/06/16
- SP-50.3.1.0, Rev 0, "TREAT Temporary Facility Modification Control," 8/25/16
- INL Memo, PLN-5146, "Contractor Readiness Assessment (RA) Plan of Action for the TREAT Restart of Transient Testing Activity" May 22, 2017 from B.L. Moon to D.J. Broussard

- ECAR 2913, Rev 0, "Evaluation of TREAT Access Hole Fuel Assembly for 300 Pound Tension Load," 8/18/15
- TEV 2021, "TREAT Archival Zr-3 Alloy Sheet, Mechanical Properties Assessment," 3/19/14
- TEV 2033, Rev 0, "Condition Assessment of TREAT Reactor Assemblies," 3/3/14
- TEV 2178, Rev 0, "TREAT Restart Fuel Assembly Inspection Strategy and Acceptance Criteria," 9/23/15
- TEV 2221, Rev 0, "Hazard Categorization for the TREAT Core Load 1469," 10/7/14
- TREAT Planned Work Order 228225, "TREAT Time Compensation and Control/Shutdown Rod Drops," 2/25/16
- Transient Reactor Test (TREAT) Facility, System Readiness Binder, System 1, Reactor Structure
- Transient Reactor Test (TREAT) Facility, System Readiness Binder, System 2, Fuel Assemblies
- Transient Reactor Test (TREAT) Facility, System Readiness Binder, System 5, Compensation Rods and Associated Equipment
- Transient Reactor Test (TREAT) Facility, System Readiness Binder, System 6, Control/Shutdown Rods and Associated Equipment
- Transient Test Program Training, Two Year Continuing Training Plan for TREAT Technical Staff, 7/15/16, Rev 00
- Employee Training History, Web based print out of Cognizant System Engineer Training Record, 6/8/2017
- TREAT Technical Support Qualification, FRM-1663, Cognizant System Engineer, 2/11/16
- QNTFCSEN, Rev 3, "TREAT Training, Engineering, TREAT Facility Specific Checklist for Cognizant System Engineers," 4/29/15
- Memo, BL Moon to JM Siems, Appointment Letter for TREAT Cognizant System Engineer, 09/19/2016
- INL Qualification/Certification Endorsement Form, Nuclear Ops Technical Staff Engineer, 2/8/2016
- Web based Training Record, QNTFCSEN – TREAT Cognizant System Engineer, 6/8/2017
- Conduct of Engineering, Web Based Training, Rev 3, 6/8/17
- Required Reading Report, LWP-10500 Configuration Management of Facility Configuration
- Required Reading Report, PDD10502, INL Configuration Management Program, 6/8/2017
- SP-50.1.1 Passive System Walkdowns, System 24
- Test Package TP-24-008, Reactor Trip System, 12/19/16
- Treat Upgrade Component Design Description, Reactor Trip System, S3330-0011-AJ-03, May 1990
- Test Package TP-06-010, Control/Shutdown Rods and Associated Equipment, 2/18/16
- S3330-0012-AJ-06, "TREAT Upgrade Component Design Description, Reactivity Control System," August, 1992

- INL 431.500-1, "System Configuration Management Plan, Control/Shutdown Rods and Associated Equipment," 8/24/16
- NL 431.500-1, "System Configuration Management Plan, Reactor Trip System," 9/6/2016
- Transient Reactor Test (TREAT) Facility System Readiness Binder 1, Reactor Structure and Readiness Checklist, 03/23/2017
- ECAR-2094, "Seismic Load evaluation of the TREAT Reactor Structure and Components using 2012 PC-2 Requirements," 6/17/15
- ECAR-2647, "TREAT Reactor Structure PC-2 Seismic Analysis," 5/12/16
- INL 431.500-1, "System Configuration Management Plan, Compensation Rods and Associated Equipment, "8/24/16
- EJ1-0001_1792, "Design, Fabrication, and Installation of TREAT Poison Assemblies," 3/26/15
- EJ4-0001_1541, "TREAT Locking Fuel Gripper Assembly," 9/9/2014
- EJ4-0002_1692, "Modify TREAT Fuel Gripper Tool," 11/19/2014
- EJ4-0003_1856, "TREAT Locking Fuel Gripper Assembly Modification," 4/25/2016
- EJ5-0002_2187, "Add Scram Air Instrument Calibration Quick Disconnects," 1/12/2017
- EJ6-0001_2214, "Modify Sensor Targets for Control/Shutdown Rod Down Indication," 4/17/2017
- EJ10-0004-1815, "TREAT Install 480v and 120v receptacles in Room 122 (machine shop)," 2/11/2016
- EJ16-0002-1930-1, "Installation of shield wall and PCM," 3/7/2017
- EJ17-0002_1754, "TREAT MFC-720 Fire Protection System Modifications," 4/13/2016
- EJ20-0004_1737, "Refurbishment of MFC-724," 12/15/2016
- EJ21-0005_2101, "TREAT Install ARCS Cabinet Cooling Fans," 11/3/2016
- FOR-298, "TREAT Systems Functional and Operability Requirements," Rev 3, 4/25/17
- LST-718, "Safety Systems at INL Nuclear Facilities", Rev 14, 4/18/17
- LWP-10105, "Facility/System Requirements Documentation," Rev 5 8/25/2016
- Memo, From JR Biggs to DJ Broussard, TREAT System Acceptance and Operability Declaration, 4/12/17
- SP 50.1.2, "Functional Testing of TREAT Systems and Components," Rev 2, 4/10/2017
- SP 50.1.6 Rev 3, "TREAT System Readiness Process," 4/10/2017
- TEV 2097, "Classification of TREAT Systems, Structures, and Components," Rev 3, 10/11/2016

Interviews Conducted

- Cognizant System Engineers (2)
- System Engineers (2)
- Configuration Management Coordinator

- I&C Support Engineer
- Safety Analysist
- Engineering Manager
- Maintenance Manager

Evolutions/Operations Witnessed

- Control/Shutdown Rod Drive System Walkdown
- Reactor Trip System Walkdown
- Control Rod Shock Absorber Replacement

DISCUSSION OF RESULTS

1. *Configuration Management requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility in order to maintain control over facility design with emphasis on safety related systems.*

The TREAT configuration management requirements (CM) are developed from the corporate Program Description Document, INL Configuration Management Program. The INL CM program is developed from source DOE documents that includes the appropriate Integrated Safety Management Requirements (ISM). The configuration of all Structures, Systems and Components (SSCs) are managed at INL; each system at TREAT has an associated configuration management plan developed to support restart activities. The SSCs with the higher risk are managed first; thus placing emphasis on safety related (SR) and non-safety related augmented requirements (NSR-AR) The INL CM program is based on 3 primary elements: 1. SSC identification, 2. Graded Approach Determination, and 3. Design Requirements and Supporting Documentation.

The "TREAT Configuration Management Program Implementation Plan" (PLN-4797) describes how the CM program is implemented from the INL lab-wide procedure at the TREAT facility. Since the reactor shutdown, an active CM program for TREAT was not maintained. The process to capture the existing documentation and drawing began in May 2014. This plan establishes the roles and responsibilities for the implementation of CM at TREAT through the utilization of LWP-10500, "Managing the Configuration of Structures, Systems and Components" and PDD-10502, "INL Configuration Management Program." Three primary components of the CM reconstitution effort include:

a. Identify all systems at TREAT; assign system numbers, assign Cognizant System Engineers for SR systems, upgrade component labeling, and complete form 431.500-1, Configuration Management Plan for each system.

b. Supporting documentation identification & component numbering: identify all supporting documentation and relabel all components, enter system information into MEL, assess and verify drawings.

c. MEL list development and document recovery

The program supports the Technical Specifications requirements contained in section 5.7 for Configuration Management Control which requires the following:

1) Identification of items for configuration control. Configuration control should include documents that apply to design, construction, and operation of the TREAT facility, such as safety basis documents, maintenance, and training manuals, program implementation plans, procedures, and manuals.
2) Configuration control should include verification, validation, and acceptance criteria for configuration control of these items and review and approval of these items and their changes.

For Safety Related SSCs, LWP-10500, "Managing the Configuration of Structures Systems and Components" identifies the supporting documentation necessary for the CM program. These documents include design criteria, system design descriptions, system acceptance testing, essential drawings, master facility drawings, supporting analysis, operating procedures, maintenance procedures, vendor data, and documented safety analysis.

Overall, the TREAT CM approach meets the DOE Standard for this Safety Management Program consistent with the hazards analysis of the TREAT Facility. Through the Laboratory Policy a formal approach is established that endorses the use of CM and the Facility has documented the process in its local procedures. Key roles and responsibilities are defined, as are the structures systems and components. Each system has an established CM plan that identifies interfaces and graded approach application. Involved individuals are knowledgeable about the activities. The establishment of the CM coordinator position enables a built in verification of the processes to ensure appropriate application. One issue was noted with the documentation of the internal reactor components that was resolved during the review.

2. *TREAT facility processes and procedures for configuration management maintain control over facility design with emphasis on vital safety systems (including safety Related (SR) and Non-Safety Related Augmented Requirements (NSR-AR) SSCs identified in SAR-420/TS-420). In this regard they ensure that design requirements, physical configuration, and associated documentation of the SSCs are controlled throughout the life of the facility, even as changes are made.*

    a. *SSCs (including Vital Safety Systems and safety related design features) are defined and a formal program for modifying facility systems and procedures as applied to the project is adequate and implemented at the TREAT facility*

    b. *A technical baseline is established and configuration control plan is implemented to control the technical baseline and changes thereto with emphasis on Vital Safety Systems and safety related design features.*

    c. *A formal engineering change order (ECO) program is implemented to identify and control the issuance or modification of engineering design documents*

    d. *A formal process is in place (e.g., the USQ process) to ensure that facility modifications are evaluated for impact to the safety basis, to ensure continued consistency between the facility's physical configuration, its procedures, and the safety basis.*

    e. *A formal process is in place to ensure procedures have been revised in response to facility modifications and the Training Organization is notified of the modifications identified above by line management prior to completion of installation/operation*

The SAR/TS identified active safety systems include the compensation/shutdown rod system, the control/shutdown rod system, the manual scram system and the seismic trip system. The passive safety systems include the fuel assembly, experiment containment, core support, alignment and concrete structure. Each one of these systems as well as other non-safety related systems have a "System Configuration Management Plan" developed for the specific system. These plans provide the classification level, general description, system interfaces, functions. It designates system configuration

management level of rigor and identifies recommended documentation to support system maintenance and history.

TREAT Engineering uses the SAR and TS's as its technical baseline. These two documents contain the systems and accident analyses required to develop the foundation for an adequate configuration management program. Safety Related and Non-Safety Related Augmented Requirements are clearly identified for these systems. Cognizant System Engineers (CSEs) are also designated for the Safety Related Systems.

SP-30.1.2, MFC and TREAT Facility Modification Control implements the Engineering Job (EJ) process for TREAT. The procedure provides instructions for facility modification control in relation to engineering change control. It also ensures that modifications made to configuration controlled structures, systems and components (SSCs) are adequately evaluated, authorized, controlled and turned over at TREAT.

SP-30.1.2, "MFC and TREAT Facility Modification Control" implements the USQ requirements to ensure that modifications receive appropriate nuclear review. The preparer of a modification is required to consult with the system engineer to determine the applicability of the USQ process. In addition, when Nuclear Safety is identified as a discipline interface, additional actions are identified that must be completed as part of the engineering package. The CSEs are trained to conduct USQ evaluations themselves, however, they must consult with nuclear safety per the implementing procedure. There are presently no identified temporary modifications that can impact operations.

A formal process is established to ensure procedures are revised in response to facility modifications and the Training Organization is notified of the modifications identified by line management prior to completion of the modification. The "Engineering Change Control Procedure", LWP-10501 requires the cognizant engineer and performers of engineering packages are required to identify any deliverables or affected documents for which they are responsible and note them on the engineering job form. Appendix B, Guidance on Deliverables, and Appendix C, Discipline Interface Checklist provides guidance on when the various organizations are engaged and when deliverables are required. Temporary modifications are handled similarly. The Training and Operations organizations are notified in a timely manner and required before system turnover. TREAT Management keeps accurate records on the status of engineering jobs and tracks them until all activities are complete in the package including training and procedure revisions.

3. *Functionality and readiness of TREAT SR and NSR-AR systems has been reestablished by functional testing; establishing/reestablishing configuration management including change control, change review and design basis reviews, as required; updating drawings, as required; updating System Design Description, as required; labeling; generating PMJs, as required; and identifying vital critical spares, as required consistent with SP-50.1.2, "Functionality Testing of TREAT systems and components", and SP-50.1.6, "TREAT Systems Readiness Process".*

INL Procedure, SP 50.1.6, "TREAT System Readiness Process" describes the process to evaluate TREAT system conditions that results in the development of Readiness Binders for each system. The process includes passive systems walkdowns and visual inspections. Technical evaluations were completed where necessary including one that assessed the age related degradation. Equipment labeling was revised and applied and system functional test performed to verify that SSCs were capable of performing their functions. System readiness checklists were completed.

Each TREAT system, regardless of safety classification, has an associated System Readiness Binder developed that documents the system's CM Plan, related technical documents, drawings, test requirements and other relevant data. Each system has been operationally tested to support the restart

activities. A Technical Evaluation was completed for the Classification of TREAT Systems, Structures, and Components and is consistent with Chapter 3, Section 3.2 of the DOE approved FSAR.

Test Package TP-24-008 was reviewed; it verifies the function of the RTS to provide reactor trip when monitored parameters exceed setpoints. The functional testing requirements are derived from the SAR and TSs and the system design description. The RTS trip channels receive trip signals from reactor power, period, energy, temperature monitoring circuits, pressure switches, seismic switches, the automatic reactor control system (ARCS) control and monitor computers, the voltage monitoring system, and the reactor ground floor. Upon receipt of a trip signal, scram action is effected by interrupting the electric power to the rod scram latches and hydraulic valves, which in turn causes the rods to remove reactivity rapidly using stored energy in the scram actuation system.

During steady-state operation, the reactor is protected by the seismic, power, temperature and period trips. During the transient operation, the reactor is protected by the seismic, power, period, and temperature trips. During both transient and steady-state operations, the RTS will also trip on manual, seismic, low air pressure or hydraulic pressure for the control rod drives, ARCS, support systems, loss of HV supply voltage to nuclear detectors, loss of power and experimenter. The functional tests were completed and the test log populated with problems noted during performance. Maintenance work orders (MWOs) were prepared to repair and calibrate equipment.

Test Package TP-05-11, Rev 0 was reviewed; it performs functional testing on the compensation rods and associated equipment. The 4 compensation rods are designed to provide negative reactivity to assure adequate sub-criticality during removal of test or calibration apparatus from the reactor core. The design and functional requirements are developed from the FSAR, TS and CDD. The test acceptance criteria is specified in the test plan, consistent with the FSAR and TS requirements. The completions of these tests are documented in WO #228225.

As affected by facility modification since the 1994 suspension of operation, TREAT procedures, drawings, and facility physical configuration, are consistent with the description of the facility, procedures, accident analysis and assumptions included in the safety basis documentation. Designated active safety systems were walked down and verified to be consistent with documentation. Test documents were reviewed and CSEs interviewed to confirm that system operability and functional tests were performed.

4. *As affected by facility modification since the 1994 suspension of operation, TREAT procedures, drawings, and facility physical configuration, are consistent with the description of the facility, procedures, accident analysis and assumptions included in the safety basis documentation.*

There are relatively few facility modifications since the suspension of operations. TREAT procedures, drawings, and facility physical configuration are consistent with the description of the facility, procedures, accident analysis and assumptions included in the safety basis documentation. A review of the facility modifications and facility walkdowns indicate consistency of the plant configuration has been maintained.

The system design descriptions have not been updated since they were written as part of the major system upgrades that occurred prior to 1994. Engineering, through the System Readiness Binder has maintained a list of necessary revisions to the design descriptions that are mostly editorial. TREAT engineering intends to update the design descriptions when workload permits. The design descriptions also need to be reviewed to ensure that the description matches the current operational approach and not contain commitments related to the core reload that was not installed.

5. *Authorized modifications within the scope of the CRA have been completed and fully closed, or evaluated and determined not to affect the ability to safely start reactor operations.*

The work package associated with the Design, Fabrication and Installation of TREAT Poison Assemblies was reviewed. The package governed the installation of 16 borax filled aluminum tubes that replace 16 fuel elements to provide a large shutdown margin to permit training and rod control testing during shutdown. The large shutdown margin permitted testing of systems, verification of controls, and allowed training to be performed. The automatic reactor control system was completely exercised in its "fully simulated transient" mode. The proper functioning of components of the reactor control system, reactivity control system, and plant protection system was established and verified. The core with the borax-filled poison assemblies remained substantially sub-critical even with all the control rods withdrawn. This modification was covered under the Engineering Job process and preceded the development of the temporary modification control procedure established by SP-50.3.1.0, “TREAT Temporary Facility Modifications.”

Work order 22644601, “TREAT 720 Replace Shock Absorbers on Compensation and Control/Shutdown Rod Drives” was reviewed with the CSE and walked down. This work involved removing the appropriate rod drives and replacing the shock absorbers and reinstalling the drive mechanisms. The work order contained the appropriate technical specification limitations, QA hold points and other configuration management items for the system. The CSE was knowledgeable about the details of the work order and the job. Appropriate post maintenance testing on the rod drives was also specified in the package and completed satisfactorily for the shock absorbers.

One outstanding item exists for restart and that is replacement of the control rod/drive position sensors. These became dirty and unreliable during the shutdown, and they will be replaced prior to startup. The position transmitter is a potentiometer connected via a small gear train to one of the 2 lead screws on the rod drive. The varying resistance across the potentiometer is directly proportional to control rod position. After the replacement of the potentiometers, the calibration will be performed under the Planned Work Order 246316, “1Y TREAT-724 – Manual Reactor Control System Calibrations.” The TREAT System Readiness Checklists (FRM 1595), Section III for the Compensation Rods and the Control/Shutdown Rods has not been completed pending completion of the potentiometer replacement. The condition is documented in a system operability memo from the Operations Manager to the Plant Manager on April 12, 2017.

6. *Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that configuration management processes and procedures support safe facility operation with adequate services.*

Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that configuration management processes and procedures support safe facility operation with adequate services. The CM program as applied to the Safety Related components identified the Technical Specifications is appropriate. One observation is noted with the way the Reactor Trip System is documented as facility drawing.

System Configuration Management Plan (CMP) for System 24, Reactor Trip System (RTS) Safety Related (SR) provides a detailed drawing designating SR/NSR boundaries. The RTS is required for steady state or transient reactor operation. The functions of the RTS that are designated as SR are the manual reactor trip and the seismic trip of the compensation/shutdown rods and the control/shutdown rods as described in SAR 3.2.1. The CMP also contains system drawings designating the SR boundaries of the RTS. “INL TREAT Drawing-Type Designation Criteria” (SD-49.4.0) requires the following for Essential Drawings:

- All piping and instrumentation diagrams (P&IDS) because these are used to respond to plant events, determine compensatory actions and clarify technical requirements.
- Electrical single-line or one-line diagrams because these are used to respond to plant events, determine compensatory actions, and clarify technical requirements.
- P&IDs, electrical single-line or one-line diagrams, flow diagrams, riser diagrams, or schematics that are necessary to validate a lock-out/tag-out.

Master Facility drawings can include equipment assemblies and details for safety-related components, as listed on Form 431.500-1 "System Configuration Management Plans," for Safety related systems. The RTS drawings are not considered Essential Drawings. The procedure permits a discretionary determination to be made by the cognizant engineer or facility manager. Due to the designation of the safety related system and the degree to which the boundaries are specifically defined in the CMP for the Reactor Trip system, the system should be re-evaluated for classification as essential.

7. *Sufficient qualified personnel are available to effectively implement the configuration management processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the configuration management processes and procedures is adequate based on review of records, interviews, and observation of operational demonstrations.*

Interviews indicate that there are sufficient numbers of qualified personnel to implement the CM processes and procedures to support facility operations. The CSE's have overall responsibility for their systems and they understand their roles. They are supported by a very capable CM coordinator who provides independent reviews and checks in the program. The CSE's are responsible for developing the system configuration management plan for their respective systems, validates component and system information, verifies technical content of the supporting document, and works with the CM coordinator to develop essential drawings. The CM coordinator maintains the Master Equipment List (MEL), monitors the implementation and effectiveness of the CM Program and maintains the Engineering Job database for facility and system modification.

8. *The applicable Cognizant System Engineers are engaged in the CM process and are knowledgeable when changes are being proposed or implemented.*

The CSE's are actively engaged in the CM Process and are knowledgeable about changes that are either complete, proposed, or in-process. Training records were reviewed to verify that the CSE's had received the appropriate training for configuration management. This includes TREAT specific CM training and INL wide CM Training. Interviews and system walkdowns with CSE's demonstrated that they were knowledgeable, engaged and familiar with their respective systems.

The CSE's were very active in developing the System Readiness Binders that are discussed elsewhere in this section. They performed the system walkdowns and were responsible for the creation of the binders and determining the supporting relevant information. In each system readiness binder, the component design description is included. These Component Design Descriptions (CDDs) were developed in the 1988 to 1992 timeframe and have not been updated. The CSE's keep a list of recommended changes to these documents as a work in progress. A number these documents make reference to the old component labeling and other engineering specifications which may or may not be relevant for the present restart effort. The Project intends to revise these documents in the near future.

9. *Independent verification is implemented to verify adequacy of design products and these verifications are formally documented for items such as design inputs and constraints, accuracy of calculation, design outputs, system interactions, and assumptions are reasonable.*

Engineering Procedure, Engineering Verification describes the process for performing verifications to ensure that engineering products are adequately performed and that the engineering deliverables meet the engineering inputs. This procedure provides instructions for the performance of verification and defines verification methods, checking, reviews, approval and acceptance. It requires that NQA-1 Requirement 3, Design Verification, be implemented with a graded approach.

The INL program uses various verification approaches including Independent Peer Review, Informal Design Review, Formal Design Review, Qualification Testing, and Safety Basis Document to conduct verification of design activities. These processes vary in the degree of independence; more specificity is defined for nuclear work and safety basis reviews as defined in Appendix A, Competency of Checkers, Independent Peer Reviewers, and Formal Design Review Chairpersons to INL Procedure, Engineering Verification (LWP-10106). The process is equivalent to the independent verification process, in that the act of checking, by a separate qualified person, that design outputs meet the intended requirements. A check sheet, Appendix B, Review Question Checklist, documents the process and the items checked during the review.

10. Assessments are periodically performed to verify the conditions of systems and equipment.

As part of the initial baseline, TREAT Systems were walked down utilizing a FRM-1595, TREAT System Readiness Checklist to identify the activities necessary to prepare each system for operation. The checklist contains 3 sections: System Identification, Readiness Activities, and Final Readiness Checkouts. The completed form is located in the system readiness binders maintained by Engineering. There is a binder for each system at TREAT with associated documentation, regardless of system classification.

The passive system walkdowns for the reactor structure were completed in two phases – the first being the external inspection, and the second was scheduled for when the fuel assemblies were inspected. SP-50.1.1, Rev 1, Passive System Walkdowns was completed on 5/14/2015 for the outside of the reactor structure and issues identified. The internal portions of the reactor structure, eg., core clamping bars, grid plate etc., will be inspected as part of the reactor fuel inspections when there is more access to these components. However, the documentation from the internal review inspections were missing from the reactor fuel system readiness binder. When questioned during this CRA, the CSE replied that the inspections were performed and provided documentation to demonstrate completion of the internal inspections. The system readiness binder was updated as well. All of the safety related system inspections were completed satisfactorily in accordance with the established procedures.

Additional Assessments have been performed in relation to Configuration Management to prepare TREAT for operation. These include a, Transient Testing Program TTP Engineering Job Assessment (IAS16502), Implementation of the USQ Process for the TREAT Facility (IAS6879), Final Report for Management Self-Assessment for Readiness to Implement TREAT SAR-420 and TS-420 (ASMT 2016-0761); and TREAT System Readiness (ASMT 2017-0026). These assessments were effective in identifying and correcting issues associated with configuration management practices.

11. Prerequisites PR-6.3, PR-8.1, PR-8.2, PR-8.3, and PR-8.4 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

Prerequisites PR-6.3, PR-8.1, PR-8.2, PR-8.3, and PR-8.4 have been certified in writing by BEA on May 22, 2017 in a memo to the Plant Manager from the Engineering Manager. This memo documents that Configuration Management has been established for SR and NSR-AR SSCs defined in the SAR-420 (PR

6.3), and the required drawings and design output documents for TREAT SR and NSR-AR systems have been identified for configuration management and have been verified accurate with the field installation. Establishment of configuration management (CM) activities were conducted per PLN-4797, "TREAT Configuration Management Program Implementation Plan" and track to completion per the Readiness Process. Components of the CM Program include essential drawings, system design descriptions, equipment labeling, configuration management plans, preventive maintenance justifications and identification of critical spares.

The TREAT modification engineering jobs (EJs) were evaluated by the Cognizant System Engineer and the engineering manager to ensure systems and procedures evaluated against the approved safety basis, supporting work control documents and outstanding EJs will not affect the ability to safely start operations.

CONCLUSION

This objective was met, no findings were identified. Two noteworthy practices were identified relating to the establishment of a configuration coordinator and the development of the system readiness binders. Overall, the TREAT CM approach meets the DOE Standard for this Safety Management Program consistent with the hazards analysis of the TREAT Facility. Through the Laboratory Policy a formal approach is established that endorses the use of CM and the Facility has documented the process in its local procedures. Key roles and responsibilities are defined, as are the structures systems and components. Each system has an established CM plan that identifies interfaces and graded approach application. Involved individuals are knowledgeable about the activities. The establishment of the CM coordinator position enables a built in verification of the processes to ensure appropriate application. One issue was noted with the documentation of the internal reactor components that was resolved during the review.

FINDINGS

None

NOTE WORTHY PRACTICES

CM1-NWP-1: The designation of a Configuration Management Coordinator in the System Engineering Group helps improve the application of CM practices. It provides an internal verification step that improves the quality of the configuration management program.

CM1-NWP-2: The development of the system readiness binders provides a systematic approach to readiness activities and a baseline to support restart. The information gathered from the walkdowns, system functional tests, calculations and system repairs will be useful in maintaining the plant to support future work and has assisted in training the current staff.

Assessed by:	Chip Lagdon **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Criticality Safety

Functional Area:	Objective: CS1	OBJECTIVE MET	
Criticality Safety	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

CS1: Line management has implemented a Criticality Safety SMP to ensure safe accomplishment of work at the TREAT facility. The level of knowledge of managers and staff responsible for Criticality Safety is adequate.

CRITERIA

1. Criticality Safety requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that criticality safety activities support safe facility operation with adequate services.
3. Sufficient qualified personnel are available to effectively implement the criticality safety processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing criticality safety processes and procedures is adequate.

REVIEW APPROACH

Review criticality safety processes and procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with criticality safety.

Review Nuclear Criticality Safety Evaluations (NCSEs) for TREAT facility operations.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the criticality safety related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of the criticality safety processes and procedures at TREAT. These include:

- Management and independent assessment of criticality safety implementation and issues management documentation for issues identified through those assessments
- Presentation material and other documents used to support senior management review of the "health" of criticality safety implementation; including conclusions and assigned actions by senior management
- MSA documentation associated with criticality safety implementation
- Status and documentation of all open and recently closed specific criticality safety issues, corrective actions, and Lessons Learned

- Staffing plan for criticality safety support
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing criticality safety program activities
- Criticality safety procedures to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process
- Completed and in-progress output documentation and records associated with criticality safety activities (CSE, inspections, audits, assessments, etc.) to confirm the adequacy and completeness of criticality safety activities.

Interview selected personnel who are involved in performing, supervising, and reviewing criticality safety activities to confirm their level of knowledge and understanding of criticality safety related controls and requirements and their implementation, and confirm their role and responsibility interfaces with the operations organization. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures.

Observe criticality safety related meetings, pre job briefings and work to validate criticality safety activities are being conducted safely and in a manner that will support and sustain operations. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Confirm sufficient criticality safety staffing and equipment are available to support operations. Confirm that the knowledge of the criticality safety engineers, technicians and managers is adequate.

Confirm procedures and work documents that implement criticality safety requirements at TREAT are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Reviewer: Jason Andrus (Criticality Safety SME)

Records Reviewed

- SAR-420, “TREAT Facility FSAR,” Revision 1.
- TS-420, “TREAT Technical Specifications,” Revision 1.
- PDD-18200, “INL Criticality Safety Program,” Revision 0.
- LRD-18001, “INL Criticality Safety Program Requirements Manual,” Revision 5.
- LWP-18201, “Establishing, Operating and Deleting Criticality Control Areas (CCAs),” Revision 0
- “INL Criticality Control Master List” – May 9, 2017
- CSI16101, “Criticality Control Area Inspection Checklist – TREAT,” September 2016
- CSI15101, “Criticality Control Area Inspection Checklist – TREAT,” September 2015
- ECAR-1610, “Criticality Safety Evaluation for the TREAT Reactor Building,” Revision 1
- LST-387, “Criticality Safety Controls for TREAT,” Revision 1
- ECAR-2656, “Criticality Safety Evaluation for the LEU TREAT Fuel Assemblies,” Revision 0
- CSO and FMH Training Records

- CCA06019, "Approval to Establish, Change or Delete a Procedure Criticality Control Area (CCA) – TREAT Reactor Building," July 2006
- CCA1501, "Approval to Appoint or Change a Criticality Safety Officer (CSO)," April 2015
- CCA1502, "Approval to Appoint or Change a Criticality Safety Officer (CSO) ," April 2015
- R2A2-18206, "Criticality Safety Officer," Revision 2
- TREAT-OI-0304, "Fuel Handling Cask Operations," Revision 4
- TREAT-OI-0301, "TREAT Fuel/Dummy/Poison Movement and Evaluation," Revision 10
- TREAT-OI-0708, "Loop-Handling-Cask and Storage-Hole Operations," Revision 4
- TREAT-OI-1015, "Nuclear Material Handling," Revision 7

Interviews Conducted

- Reactor Engineering Lead
- Criticality Safety Specialist
- Criticality Safety Engineer
- Criticality Safety Manager
- SS/SRO/RO/CSO/FMHS/FMH/MBA Custodian
- Alternate SS/SRO/CSO/FMHS/MBA Custodian, RO/FMH
- Operations Manager/NFM

Evolutions/Operations Witnessed

- Fuel Cask Handling per TREAT-OI-0304 and post job briefing

DISCUSSION OF RESULTS

1. *Criticality Safety requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.*

TREAT documents are prepared within the scope of INL Criticality Safety procedures and requirements. The TREAT documents were prepared in coordination with the criticality safety program and reviewed by appropriate contributors. During the review, a number of items were identified where documents were not completed, or where review indicated that they had not been completed when necessary to comply with program standards. Among these were issues identified with; failing to clearly outline the TREAT Criticality Control Area (CCA) boundary on the Form 431.05, no update to the Form 431.05 upon changing the controlling document for the procedure CCA, or failing to have the required Criticality Safety Manager concurrence on the 2016 annual CCA inspection. All of these items were discussed with TREAT personnel and the Criticality Safety Manager. The program committed to align written documentation with in practice expectations. Feedback from these individuals indicates that all involved have a common understanding of the authorized scope of fissionable material handling evolutions at TREAT and the coverage of the criticality safety analysis for TREAT but that some clarity in program expectations and increased scrutiny of forms moving forward was warranted. A deficiency associated with form execution was identified.

Based upon the nature of evolutions performed in the TREAT facility and the identified administrative controls, the criticality safety program has determined that the possibility of an inadvertent criticality in TREAT is incredible. Consistent with the expectation of the program documents, ECAR-1610 operates as the document establishing the determination of the probability of an inadvertent criticality. This argument is established based upon the administrative controls as well as the physical forms of the material, the design of the storage locations and the nature of upset conditions necessary to establish the risk. This classification is not unrealistic and the requirement to document has been met, however the written technical basis for determination of the probability of criticality at TREAT does not meet the general guidelines for determination from LRD-18001. The nature of activities at TREAT is similar to those at other reactor facilities at INL that also do not have criticality alarm systems, and the frequency has some supporting discussion in SAR-420, so the conclusion is likely correct. However, the documented basis for the frequency from the criticality safety evaluation is light on technical discussion for the identified frequency and does not provide enough detail to ensure the criteria for evaluation under LRD-18001 pertaining to "commonly accepted engineering judgement" has been met. Defensible basis should be included in the criticality safety evaluations and a deficiency was identified.

2. *Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that criticality safety activities support safe facility operation with adequate services.*

TREAT implements their Criticality Safety Controls via a flow down that originates in the safety basis through the requirement to have a list of criticality safety controls (LST-387), then into a nuclear material control procedure (TREAT-OI-1015). They then direct compliance and entrance into TREAT-OI-1015 in procedures which contain the physical action for handling casks and containers which can enable material movement. Detailed review was performed of the TREAT analyses and their flow into the documents. The documents were comprehensive in treating the planned scope of TREAT activities. Interviews of personnel associated with development of documents and responsible for implementation identified some differences in interpretation and expectations for field execution. Some minor workability and flow issues in TREAT-OI-1015 were identified and provided to TREAT personnel, one deficiency associated with implementation of checks for requirements was identified.

In addition to safe fissionable material handling under criticality safety controls, the capability for the TREAT reactor to be maintained or made subcritical as desired is controlled through controls in the safety basis associated with reactor startup and adequate shutdown margin. The application of these controls is outside of the criticality safety program, however of necessity, there is a handoff between which rule set governs a particular loading and unloading evolution. LST-387 identifies that items loaded into or out of the reactor core are treated in a handling status until they are seated in the reactor grid plate. This is a clear description of when the items are no longer physically moving or being manipulated by operators or fissionable material handlers, however, it does not reflect the handoff as evidenced either by the analysis or the actual physics of the evolution. Contrary to the process hazards requirement from Section 3.4 of LRD-18001, there is no process analysis in the criticality safety evaluations or controls in the criticality control list to ensure prevention of a criticality during insertion of experiments or fuel into the core. When discussed with Reactor Engineering, Criticality Safety and Operations staff, all understood that there was a handoff and agreed that adequate control of reactor sub-criticality was maintained under the safety analysis and technical specifications not the criticality safety program, however no clear documentation of that handoff was identified. A deficiency was identified due to lack of clarity for the handoff and not meeting requirements for the specified handoff.

The criticality safety evaluations supporting activities in TREAT evaluate storage in the approved storage locations. These evaluations look at potential upset conditions associated with storage and derive specific limits for each material type in each storage location, however they do not identify the design of the storage locations as either important assumptions or engineered features. This is in stark contrast to SAR-

420, which identifies Fuel Storage as non-safety related controls that have augmented requirements, implying some level of design feature. The discrepancy between the safety basis and the criticality safety evaluations isn't an immediate threat to safe operations of the plant because control of the design of the storage locations is protected by nature of their augmented requirements role in the safety basis. However elements of the design are incorporated into the criticality safety analysis assumptions, subsequently a deficiency is noted rather than a finding.

3. *Sufficient qualified personnel are available to effectively implement the criticality safety processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing criticality safety processes and procedures is adequate.*

The TREAT staffing plan identifies necessary minimum personnel for compliant as well as programmatic operations. Currently minimum personnel standards are met for all criticality safety related activities. These personnel are primarily provided as direct reports to the TREAT organization and have shared qualifications. While the Fissionable Material Handler and Fissionable Material Handler Supervisor roles are not explicitly identified in the staffing plan, these roles and qualifications are covered within those assigned to the Reactor Operator and Senior Reactor Operator respectively. Technical support regarding Criticality Safety Engineering is provided through a matrixed relationship back to the Criticality Safety Engineering Program organization. Despite this matrixed relationship, communication appears to be strong between the two organizations. Criticality Safety Officers indicated that the responsible Criticality Safety Engineers will stop by just to keep in touch on a routine basis to ensure lines of communication are open. A noteworthy practice was identified.

The need for Criticality Safety Engineers is identified in the TREAT staffing plan however, future funding to support that resource need is not specifically allocated at a level consistent with the staffing plan as part of TREAT planning. This was discussed with TREAT personnel and an explanation that much of the operational planning is not specifically at that level of granularity was provided. Management continues to emphasize and demonstrate a commitment to the criticality safety program at TREAT.

All identified staff have completed qualifications for their designated roles with additional staff currently in the process of qualifying. Interviews with qualified staff and managers indicated that staff are aware of technical details of criticality safety as they relate to TREAT as well as the manner in which the program is implemented in TREAT. All were familiar with the implementing procedure, TREAT-OI-1015, as well as the document containing all TREAT criticality safety controls, LST-387.

CONCLUSION

The objective was met. No findings were identified. Five Deficiencies were identified. One Noteworthy Practice was identified. A thorough review and evaluation of the criticality safety hazards for TREAT operations appears to have been performed in a manner consistent with expectations from the company program. However, lack of rigor in documentation as well as inconsistencies between written procedures, verbal expectations and understanding based upon discussions requires additional written clarity to establish clear and consistent expectations.

FINDINGS

None

NOTE WORTHY PRACTICES

CS1-NWP-1: Proactive Engagement from the Criticality Safety Engineering Organization with Criticality Safety Officers and facility management.

DEFICIENCIES

CS1-DEF-1: Contrary to Step 4.1.10.1 of LWP-18201 that indicates the Criticality Safety Officer (CSO) should update Form 431.05 for changes to the CCA, no update has been processed since the initial creation of the CCA in 2006. Discussions with Criticality Safety Program management indicate that this is not a program expectation. Clarity in the program requirements and rigor in their implementation and tracking needs to be established.

CS1-DEF-2: LRD-18001 states that an evaluation for the need of a CAS shall be performed if the facility contains greater than 700 g ^{235}U, with the criteria for need being defined as incredible (10^{-6} per year). This evaluation appears to be documented in ECAR-1610, however the discussion lacks sufficient basis to demonstrate that the implementation of administrative controls is sufficient to establish "reasonable grounds of incredibility based on commonly accepted engineering judgement" as required by Section 3.8 of LRD-18001.

CS1-DEF-3: The form in Appendix A of TREAT-OI-1015 does not require identifying the particular rule that is used to authorize the fissionable material move. Subsequently in addition to potentially misidentifying the rule set being verified, as set up there is no spot to challenge the handling limit while the evolution is underway. As demonstrated this was identified in the comments section. No mechanism for tracking/checking what is out of storage in a handling status exists.

CS1-DEF-4: SAR-420 identifies the Reactor Fuel Storage locations as Non-Safety Related – Augmented Requirements, however the supporting Criticality Safety Evaluations, ECAR-1610 and ECAR-2656 are inconsistent with this designation. Although some of the spacing provided by the storage locations is included in the analyses in the CSE that demonstrates sub-criticality, they are not identified in the evaluations as either important assumptions or engineered features. This could lead to confusion and a misconception that the spacing provided from this design is not important to the results of the CSEs and validity of the corresponding controls.

CS1-DEF-5: The hand-off between Reactor Safety and Criticality Safety is not adequately defined. LST-387, "Criticality Safety Controls for TREAT," defines handling as until seated in the reactor grid structure, however contrary to Section 3.4 of LRD-18001 no process hazards analysis or controls are established in LST-387 for reactor fuel/experiment handling when not seated in the grid plate, because it is expected to be covered under the reactor safety analysis.

Assessed by:	Jason Andrus **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Emergency Preparedness

Functional Area:	Objective: EP1	OBJECTIVE MET	
Emergency Preparedness	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

EP1: Line management has established and implemented an Emergency Preparedness (EP) SMP to ensure safe accomplishment of work and as a part of that program, a routine operations drill program and an emergency management drill and exercise program have been implemented and records for each program are adequate to demonstrate the effectiveness of completed drills and exercises as well as planning for future drills and exercises. The level of knowledge of EP managers and staff is adequate.

CRITERIA

1. Emergency Preparedness requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that emergency preparedness processes and procedures supports safe facility operation with adequate services.
3. Sufficient qualified personnel are available to effectively implement emergency preparedness processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the emergency preparedness processes and procedures are adequate based on review of records, interviews, and observation of operational demonstrations.
4. An Emergency Management Plan (EMP) has been developed and implemented for the TREAT facility. An Emergency Planning Hazards Assessment (EPHA) has been developed for the TREAT facility and approved by DOE ID and pre-determined Emergency Action Levels have been implemented at the TREAT facility to protect workers and public.
5. A TREAT Drills and Exercises program procedure has been established and implemented and drills and emergency exercises have been performed and evaluated in order to demonstrate proficiency at the TREAT facility. When weaknesses or opportunities for improvement are identified, corrective actions are developed and tracked through closure.
6. Records for each drill at the TREAT facility are adequate to demonstrate the effectiveness of completed drills and exercises as well as planning for future drills and exercises.
7. Operations and operations support personnel at the TREAT facility demonstrate abnormal and emergency event response in emergency exercises, operational drills, tabletop drills and/or field performance demonstrations, including effective interfaces with TREAT facility stakeholders and Emergency Response Organization (ERO).
8. Prerequisites PR-10.1 and PR-10.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review emergency preparedness processes and procedures, the EMP and EPHA to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with emergency preparedness

Review the Resource Conservation and Recovery Act (RCRA) Contingency Plan as it applies to the TREAT facility.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the emergency preparedness related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of the emergency preparedness processes and procedures at the TREAT facility. These include:

- The TREAT Emergency Management Plan and Implementing Procedures
- TREAT EPHA
- TREAT Hazards Survey
- Drill/Exercise Packages, Scenarios, Plans and Procedures; Emergency Preparedness Implementing Procedures (EPIPs), Alarm Response Procedures and Emergency Operation Procedures; Fire Drill Records, Evacuation Drill Records, Shelter-in-Place Records, and post drill/exercise critique Action Reports and hot wash records.
- Review Escape & Evacuation Plans
- Management and independent assessment of emergency preparedness implementation and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of emergency preparedness implementation at the TREAT facility; including conclusions and assigned actions by senior management
- MSA documentation associated with emergency preparedness implementation.
- TREAT emergency equipment maintenance records
- Status and documentation of all open and recently closed specific emergency preparedness issues, corrective actions, and Lesson Learned.
- Staffing plan for emergency preparedness support.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing emergency preparedness program activities at the TREAT facility.
- Emergency preparedness procedures at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.

- Completed and in-progress output documentation associated with emergency preparedness activities at the TREAT facility to confirm the adequacy and completeness of emergency preparedness activities.

Interview selected personnel who are involved in performing, supervising, and reviewing EP activities to: confirm their level of knowledge and understanding of EP related requirements and their implementation and confirm their role and responsibility interfaces with the operations organization. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures. Personnel interviewed will include those in the following positions: Plant Manager, Operations Manager, Facility Manager, Select Shift Supervisors, Reactor Operators, Emergency Management Manager and select staff, Nuclear Safety Manager and select staff, ESH Manager and select staff, Radiological Control Manager and select staff, and other ERO managers and staff.

Observe emergency preparedness related meetings, pre job briefings and work in the field to validate emergency preparedness activities are being conducted safely and in a manner that will support and sustain operations. Attend POD/POW meetings to determine the level of integration of drills and exercises into TREAT facility operations. Attend meetings involving the emergency planning functions (EPHA development, development of abnormal/emergency operations procedures, emergency exercise and operational drill planning, Post Drill and exercise critiques, evaluations and hot-washes, meetings involving emergency preparedness related lessons learned and corrective actions, etc.). During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Observe evolutions showing response to abnormal and emergency events, training drills or exercises (including associated controller and evaluator briefings and post exercise critique and player hot washes). Evaluate the effectiveness of the techniques used to simulate upset conditions when required.

Confirm sufficient qualified emergency preparedness staff and equipment are available to support operations.

Confirm procedures and work documents that implement emergency preparedness requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm that the knowledge of the TREAT facility emergency preparedness staff and managers is adequate and confirm their demonstrated commitment to comply with procedure requirements.

Reviewer: Forest Holmes

Records Reviewed

- SAR-420 TREAT Facility FSAR Rev. 1
- Tech Spec 420 Rev. 1
- CTR-199 Charter for the Emergency Preparedness Implementation Team Rev. 3
- TREAT-EAR-001 Emergency Information and Procedures Rev. 5
- TREAT-EAR-002 “Loss of TREAT Power” Rev. 1
- TREAT-EAR-005 “TREAT Alarm Response” Rev.1
- TREAT-OI-0504 Reactor Operations Rev. 2
- TREAT-OI-0507 Transient Operations Rev. 3

- TREAT-OI-0512 Initial Reactor Startup and Performance Verification Rev.1
- TREAT-OI-0801 "Electrical Distribution" Rev 4
- TREAT Timely Order #17-05
- LWP-9201 Briefings
- EHS-70 Emergency Management Hazards Survey for MFC including INTEC Rev. 2
- EHA-70 Emergency Management Hazards Assessment for the MFC Rev. 7
- EPI-42 "Sustained Loss Of Commercial Power At MFC" Rev 4
- EPI-64 "Incident Command on the INL" Rev 11
- EPI-77 Reentry Rev.11
- EPI-91 MFC Emergency Response Organization Activation Rev. 10
- MFC-1 Emergency Action Manager ERO Checklist Rev. 7
- INL forms 150.05 and 150.05A Emergency Work Permit Pages 1 and 2
- LWP-16105 "Reporting Changes of Hazards to Emergency Management" Rev 5
- Form FRM-1551 Meteorological Check Sheet Rev. 1
- Drill scenario and drill report for MFC.U.008_111416
- Drill scenario and drill report for MFC.U.008_012517
- Drill scenario and drill report for MFC.U.008_112916
- STD-1145 "Operations Drill Program" Rev.5
- GDE-467 "Emergency Drills and Exercises" Rev.2
- Drill scenario MFC.C.013_061317
- INL Emergency Plan/RCRA Contingency Plan (PLN-114) Rev. 89
- TREAT Drill Guide TRED007P "Evacuation with Contaminated Injured Person" Rev. 0
- TREAT Drill Guide TRED008P "Abnormal Hydraulic Response During Power Operations" Rev. 0

Interviews Conducted

- Two TREAT Emergency Bus Drivers
- Oversight & Assurance Division Director
- Quality Engineer
- Two TREAT Shift Supervisors
- TREAT Reactor Operator
- MFC Emergency Planner
- Two TREAT Training Instructors
- TREAT Operations Manager

- TREAT Rad Con Manager
- TREAT Facility Manager

Evolutions/Operations Witnessed

- 4-24-27 Fuel Handling Cask Evolution including the prebrief, and postjob review
- 4-26-17 Loop Handling Cask and Storage Hole Operations Evolution including the prebrief, and postjob review
- 4-26-17 Operations Drill including the prebrief and post drill review
- 5-4-17 Facility Tour
- 5-8-17 CRA drill planning meeting
- 5-31-17 Operations Drill including the prebrief and post drill review
- 6-7-17 Operations abnormal conditions drill including prebrief and post drill review
- 6-13-17 ERO drill including the prebrief (held on 6-12-17) and the post drill review
- 6-14-17 Operations drill including prebrief and post drill review

DISCUSSION OF RESULTS

1. *Emergency Preparedness requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility. This is demonstrated by the below information.*

The INL Emergency Management (EM) program implements the requirements of DOE Order 151.1C and Resource Conservation and Recovery Act (RCRA). The INL Emergency Plan/RCRA Contingency Plan (PLN-114) is the top tier document in the document hierarchy for program implementation. Site wide and facility specific response actions are addressed in emergency plan implementing procedures (EPIs). The Materials & Fuels Complex (MFC) EPIs address the emergency response organization (ERO) activities in support of the TREAT facility. The status of the TREAT facility is stated as preparing to resume operations, and this condition has been reflected in revised EPIs and ERO training materials. In addition to the EPIs, TREAT facility abnormal operating procedures capture actions that TREAT operations personnel are to take in responding locally to events and in support of the MFC ERO. These emergency alarm response procedures (EARs) should contain information essential to carrying out actions to immediately protect workers at TREAT and to provide information necessary for the MFC emergency action manager (EAM) to conduct emergency categorization/classification, and issuing protective actions. During the course of this readiness assessment the following observations were made relative to the documents and processes used to implement the emergency management program is support of TREAT activities. Correction of the problems identified in this review will improve implementation of an effective EM program at the TREAT facility.

INL Emergency Plan Implementing Procedure (EPI-77 Reentry) defines requirements for conducting reentries into areas evacuated during an operational emergency as defined by DOE 151.1C. LWP-9201 Briefings defines requirements for the conduct of briefings for a wide variety of situations. Inclusive of these situations is an operational emergency reentry activity. While LWP-9201 references EPI-77, EPI-77 does not acknowledge the existence of LWP-9201. Additionally LWP-9201 levies additional briefing requirements onto EPI-77 covered activities that are not addressed in EPI-77 or the forms used to cover reentry briefings (INL 150.05 and INL150.05A).

EPI-92 (MFC Operational Emergency Categorization/Classification and Protective Actions) provides no useable directions for establishing access control over an area where protective actions (take shelter or evacuate) have been initiated. All sections of EPI-92 direct the user to refer to section 4.8 for establishing

access control. Section 4.8 contains no actions for establishing access controls. These actions, normally assigned to the INL Protective Force, should be specified for the EAM to assign in section 4.3.

The TREAT Safety Analysis Report (SAR 420) section 15.1.5.3.4 incorrectly states how emergencies are managed. This section refers to a TREAT emergency coordinator and a Site emergency coordinator as responsible for taking actions. According to the INL Emergency Plan/RCRA Contingency Plan, these positions do not exist.

The tracking mechanism and prompting to ensure completion of the annual independent audit of the emergency management program for the TREAT facility, as identified in SAR 420 section 16.6.2.6.2 and Tech Spec AC5.7.2 needs improvement.

The INL Emergency Plan/RCRA Contingency Plan (PLN-114) Section 2.1.4.2 addresses facility emergency preparedness implementation teams (EPITs) as the vehicle used to coordinate and implement EM programs for INL facilities. CTR-199 covers activities for the MFC EPIT. TREAT facility management is listed as a part of the MFC EPIT in CTR-199. TREAT facility management has not been invited to participate in MFC EPIT activities by the MFC emergency planner because of an antiquated distribution list.

The TREAT accident protective action distances for accidents identified in the MFC emergency plan implementing procedure EPI-92 do not allow for a consistent, conservative, and easily implemented evacuation distance for events impacting the immediate TREAT area. The protective action distances for these events, vary from 100 meters to 400 meters. The TREAT access barricade is appropriate geophysical boundary and the logical isolation distance for these events. Reverting to a standard evacuation to the barricade would simplify the responses.

These issues should be evaluated for inclusion in the LabWay issues management system or otherwise solved.

2. *Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that emergency preparedness processes and procedures supports safe facility operation with adequate services. . This criterion is demonstrated by the following information.*

The TREAT reactor building (MFC-720) and the TREAT Reactor Control Room building (MFC-724) are the main locations for response actions for events originating at the TREAT facility. The voice paging system terminals for providing verbal announcements to initiate response of actions to TREAT facility personnel are located in MFC-720 and MFC-724. A local TREAT evacuation system has been taken out of service and will be evaluated for returning to service at some undetermined future date. To initiate an evacuation of the TREAT reactor building, a fire alarm is activated in the reactor building. Activating this fire alarm also initiates a response from the INL Fire Department MFC Station (Station #2). During an emergency, communications between the TREAT Shift Supervisor (SS)/Building Emergency Director (BED) is initially via the INL radio system. This line of communication is supplemented by use of cellular phones. In the TREAT Control Room these communications are augmented by landline telephones. The TREAT Control Room also has plant CAM and RAM readouts to allow monitoring of radiation and airborne contamination values should a TREAT reactor building evacuation being initiated. The TREAT SS/BED maintains an emergency response book that contains materials used to support response actions. Included in this book are TREAT EARs and other materials. During the course of this readiness assessment the following observations were made relative to the facilities, equipment, and TREAT focused documents and processes. Correction of the problems identified in this review will improve implementation of an effective EM program at the TREAT facility.

EPI-92 Rev. 21 MFC Operational Emergency Categorization/Classification and Protective Actions has a number of inadequacies regarding physical implementation of protective actions. The procedure does not

provide an avenue for the Emergency Action Manager (EAM) to initiate prompt protective actions (evacuation of take shelter) prior to categorizing & classifying an event. Additionally, this procedure does not have an accommodation for compensatory measures in the event of an evacuation being required and the primary system (sirens) is out of service.

A review of SAR 420 identified the following items relating to the emergency management program at TREAT. SAR 420 Chapter 9, section 9.10.2.2, identifies the two way radio system as one of two communication systems that can be used for facility to offsite communications. This section of the FSAR incorrectly refers to the INL Warning Communications Center as the DOE Warning Communications Center. The error in title needs to be addressed in a future revision to the FSAR. And given the frequent problems identified with the two way radios at TREAT, greater rigor needs to be applied to resolving the problems experienced in using the radios as evidenced during drills.

TREAT-EAR-001 in section 7 provides directions for responding to hazardous material spills. This section of the procedure is for responding to spills that may contain highly toxic chemicals, transuranic materials or mixed waste. This section in step 6.1.1 directs facility personnel to immediately exit the area without attempting to stop or secure the spill. Actions in subsequent steps provide directions to the responding haz mat team (the INL Fire Department) on how to manage the spill. The INL Fire Department should be a mandatory reviewer of this procedure to ensure actions directed are compatible with Fire Department response protocols. Additionally, for a radiological spill, the user is directed to perform applicable section 8. Section 8 is for responding to a radiation area monitor alarm. The proper section to go to is Section 7. Section 6 does not provide direction to notify the INL Spill Notification Team to ensure mandatory reporting is carried out. Like Section 6, Section 7 of TREAT-EAR-001 provides directions for responding to spills that may contain highly toxic chemicals, transuranic materials or any other unknown. There appears to be conflicting guidance in sections 6 & 7 as to which is appropriate to use for similar conditions.

TREAT-OI-0504, TREAT-OI-0507, and TREAT-OI-0512 have a precaution and limitation “The Shift Supervisor (SS) shall consider reactor shutdown whenever thunderstorms are forecast in the immediate area due to potential electronic component damage associated with lightning strikes.” During the course of executing these procedures FRM-1551 (Meteorological Check Sheet) is used to verify weather conditions meet standards for the conduct of reactor operations. The form identifies weather forecast sources that may not be current in all situations. And the form checks for a forecast of a tornado and not thunderstorms. TREAT should review the validity of the need for this precaution, and if the need still exists, then update FRM-1551.

The TREAT voice paging system is not formally or routinely tested. The voice paging system is used as a compensatory measure for areas where sirens and not operable per TREAT Timely Order #17-05. Given this condition, TREAT should implement a formal routine preventative maintenance testing protocol for the TREAT voice paging system to ensure requirements of 29 C.F.R. 1910 are met.

TREAT-EAR-002 “Loss of TREAT Power” Rev. 1 does not contain a step to notify the MFC Emergency Action Manager (EAM) when there is a loss of power at TREAT. TREAT-EAR-002 relies on implementing actions from EPI-42 “Sustained Loss Of Commercial Power At MFC” Rev 4 which has an initiating condition requiring the MFC EAM to activate the Emergency Control Center (ECC). Additionally, the MFC EAM must be notified to ensure that an evaluation of the loss of power conditions is made against criteria for EAL MFC-ALL-6.OE.1. This is an example of why TREAT needs to do an extent of condition to see if additional omissions exist.

The TREAT Emergency Alarm Response (EARs) procedures have not been base-lined against the MFC emergency plan implementing procedure EPI-92. The base-lining needs to be completed to ensure that the TREAT shift supervisor initiates protective actions commensurate with the actions called out in EPI-92 as

called for in the hazards assessment document covering TREAT activities (EHA-70) and as required by DOE Order 151.1C.

These issues should be evaluated for inclusion in the LabWay issues management system or otherwise solved.

3. *Sufficient qualified personnel are available to effectively implement emergency preparedness processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the emergency preparedness processes and procedures are adequate based on review of records, interviews, and observation of operational demonstrations. . This is demonstrated by the below information.*

During the course of this review, members of the management team were interviewed to evaluate their level of knowledge and their engagement and commitment to the implementation of the EM program. The management team was found to be knowledgeable of the program and how it is implemented. The workers interviewed clearly understood their role in program implementation and most importantly on the response side of the EM program. Interviews conducted with the MFC emergency planners revealed this individual to be knowledgeable and committed to the EM program efforts to support resumption of operations. The MFC ERO is comprised of four teams rotating on duty on a one week in four rotation. The composition of the MFC ERO teams is defined in section 2 of the INL Emergency Plan/RCRA Contingency Plan. A check of the MFC ERO team rosters revealed there are several vacancies on the MFC ERO teams. The most senior of these positions is an emergency action manager. The vacancy for this position is filled by another EAM when the team with the vacancy goes on duty. A temporary duty change form is submitted to ensure there is an EAM to fill the vacancy. A review of the records for testing the availability of the ERO was completed. Testing is conducted at 1600 on the day an ERO team goes on duty. There is no systematic testing of availability during off-normal hours. Correction of the problems identified in this review will improve implementation of an effective EM program at the TREAT facility.

A review of the list of emergency bus drivers submitted in evidence files shows that three personnel are not current in their training. The ERO Bus Driver qualification is not being added to the qualified individuals Job Codes which is the INL process that ensures individuals do not expire on qualifications. This is an INL issue.

As displayed during interviews with TREAT operations personnel, there is a need to complete additional familiarization training with TREAT EARs. Table top reviews with operations personnel should be considered to ensure that use of the EARs meets the expectations of TREAT management.

These issues should be evaluated for inclusion in the LabWay issues management system or otherwise solved.

4. *An Emergency Management Plan (EMP) has been developed and implemented for the TREAT facility. An Emergency Planning Hazards Assessment (EPHA) has been developed for the TREAT facility and approved by DOE ID and pre-determined Emergency Action Levels have been implemented at the TREAT facility to protect workers and public. . This is demonstrated by the below information.*

The INL Emergency Plan/RCRA Contingency Plan (PLN-114) provides a framework for responding to emergencies originating and INL facilities or for responding to events impacting INL facilities. A comprehensive facility hazards screening document (EHS-70) has been completed, as required by DOE 151.1C, to identify hazards that require screening for inclusion into the INL EM program. This screening document identified hazards that were analyzed in the hazards assessment document EHA-70. Events analyzed identified a need for emergency action levels to be provided within EHA-70. EALs for

operational emergencies classified as alerts and site area emergencies were developed and have been included for use by the MFC EAM in EPI-92. These EALs provide a set of initial conditions of sufficient detail to allow for a timely and accurate determination of applicability. Additionally, the protective actions to be implemented for each EAL are embedded in the EAL. While the protective action distances defined in the EALs are technically correct. In most cases the ability to isolate for distances less than that of the TREAT barricade is not practical. Consideration should be given to isolating the TREAT reactor building at either the TREAT exclusion area fence or at the TREAT barricade. During an ERO drill performed on 6-13-17 the MFC EAM demonstrated the ability to correctly categorize, classify and issue protective actions for the scenario postulated by the drill scenario.

A review of the INL Emergency Plan/RCRA Contingency Plan (PLN-114) revealed the following items relating to the TREAT facility. Section 1.4.1.1.3 for the Materials and Fuels Complex (MFC) does not address the TREAT facility. While other similar sections in section 1 list the major activities or buildings inside of a facility, the MFC section does not. Section 1.4.2.7.3 generically refers to the diesel generators at the TREAT facility as emergency generators. This is not the case. During the course of the review a question was raised relative to the Californium-252 stored at MFC-720. It was initially thought to have not been included in the materials identified during the screening process as published in the Hazards Screening Document (EHS-70 Rev. 2) for the MFC. It was discovered that the Cf 252 was a source material not accounted for as source material on the source inventory. Documentation was provided showing that the Cf252 was analyzed and found to be off lesser significance than other materials stored in that part of the TREAT facility.

5. *A TREAT Drills and Exercises program procedure has been established and implemented and drills and emergency exercises have been performed and evaluated in order to demonstrate proficiency at the TREAT facility. When weaknesses or opportunities for improvement are identified, corrective actions are developed and tracked through closure. This is demonstrated by the below information.*

TREAT drills and exercise program procedures are provided in STD-1145 for operational drills and GDE-467 for the INL ERO drills and exercises. Drills are scheduled and run in support of the MFC and TREAT and MFC facilities. Not all of the MFC ERO drills are scoped to include participation by the TREAT facility. To date several ERO drills did include TREAT participation. An ERO drill including the TREAT facility was run in conjunction with a TREAT operations drill as part of the TREAT CRA. Issues identified during the TREAT operations drills are tracked in the INL LabWay issues management system. Similarly, issues identified during the ERO drills are identified in a formal drill report and are also entered into LabWay. A review of the issues identified during the conduct of ERO drills run on 11-14-16, 11-29-17, 1-25-17 was accomplished to ensure tracking and completion issues was carried out. The drill reports identified no issues were identified during the drill and review of performance process. As such, no problems were found with the process of addressing and resolving issues identified during ERO drills. No corrective actions were identified as needed in the drill reports for 2016 and 2017 TREAT related ERO drills. During the drills observed by the CRA Team, several observations showing a need for performance improvement were identified. They are listed below. Correction of the problems identified in this review will improve implementation of an effective EM program at the TREAT facility. The drill run on 6-13-17 was carried out under adverse weather conditions. The willingness to conduct a drill in cold, windy and rainy conditions speaks well of the commitment to truly testing the response capabilities.

During the conduct of pre CRA operations level drills observed by the CRA team, 4-26-17 and 5-31-17, problems with handheld radios that hindered emergency communications were observed. Drill participants stated in post drill participant reviews that the radios were normally a problem in the response to drills. Additional rigor is needed in the conduct of TREAT involved ERO drills to more thoroughly test equipment used in responding to emergencies.

During the Pre CRA 5-31-17 TREAT operations training drill, the responders demonstrated a lack of urgency to initiate and complete a timely evacuation of the facility as defined in Emergency Action Level (EAL) MFC-720-3.SAE.1. Evacuation of the TREAT reactor building to an area outside the TREAT exclusion area fence was completed within 3 minutes of announcing the direction to evacuate. An evacuation of all nonessential personnel to at least 400 meters was not completed for 27 minutes from the time of event initiation. The fire alarm was activated at 0913 and the clearing of the 400 meter mark was completed at 0940. Whilst the initial clearing of the exclusion area was carried out in a timely manner, the concern is the delay in evacuating the remainder of the 400 meter distance prescribed by the EAL and as directed by the EAM. Delays were caused by conducting radiological surveys of personnel and a failure to discern resources needed to support fire department personnel with handling a contaminated injured employee.

During the Pre CRA 5-31-17 TREAT operations training drill, personnel had no physical indicators of wind direction (wind sock). While exiting the building, building wake effect provided for confusing wind directions. And while HPTs directed personnel that were thought to be potentially contaminated to not pass upwind of those that were not thought to be uncontaminated, this did not take place.

During the Pre CRA 5-31-17 TREAT operations training drill facility monitoring team personnel did not have proper equipment, forms or maps needed to support taking airborne or smear-able contamination surveys. Tweezers needed to support handling smears and air sample filter papers were not in the equipment kit. The personnel relied on a personal cell phone for tracking time versus a clock or stop watch. Personnel were not experienced in working in windy conditions and lost control of smears taken. Smear samples were not labeled as to location taken nor were they segregated for retention, they were disposed of in a bag containing waste.

The INL Fire Department did not implement an effective incident command, as required by EPI-64 “Incident Command on the INL” Rev 11, at the event scene of the 6-13-17 drill. The first indication of this problem was found when during the course of the drill the Building Emergency Director attempted to contact the responding Fire Department and the EAM. While the communications were acknowledged by the EAM, the Fire Department did not respond on two occasions. Additionally, the INL protective force did not participate in Incident Command at the scene during the drill, nor did they communicate with the BED or the IC. Upon arrival the IC was briefed by the BED on the status. A delay in providing care to a critically injured patient was observed when after four attempts to convince the IC that the patient injuries were such that they precluded the contamination that was suspected to be on the patient, the IC finally directed the response to treat the patient to begin. Communications from the BED to the IC were not repeated back by the IC. The BED relayed the direction from the MFC EAM to evacuate to 400 meters. After the patient was packed and ready to transport to the receiving medical facility, the IC departed the scene in the ambulance without giving directions to the three remaining INL fire fighters to evacuate the area. When questioned, the three fire fighters were unsure of what was expected of them or what they should do. Additionally, when queried at the player debrief the IC stated that Rad Con was in-charge, showing a lack of understanding of the principles of incident command as defined in EPI-64. This failure is contrary to DOE Order 151.1C Attachment 2 which states “Contractors must develop and implement a Comprehensive Emergency Management System designed to protect the health and safety of all workers and the public from hazards associated with DOE/NNSA operations and those associated with decontamination, decommissioning, and environmental restoration;”

This issue has been identified as a Post-Start Finding.

The ERO responders in the MFC ECC did not consistently use procedures or position specific ERO checklists as required by the INL Emergency Plan/RCRA Contingency Plan. Towards the end of the drill many ERO responders, including the EAM chose to initiate and complete their checklists.

An effective use of resources was not demonstrated during the TREAT facility evacuation. Personnel were not all loaded onto the evacuation bus until the patient had been packed for transport. Instead of assigning a minimum number of personnel to remain to support the handling of the injured person, all TREAT facility personnel remained waiting for all actions to be completed. This is not a good use of ALARA principles in responding to an event.

Emergency equipment at the TREAT Control Room should be evaluated to be upgraded to support response actions. Equipment needs such as radio batteries, radio battery chargers, a copy of INL LST-26 for emergency phone numbers, and a checklist to provide consistent and effective response actions are needed to improve capabilities and performance.

The operations drill scenario information used to provide players with response information needs improvement. Information on RAM and CAM readings for the TREAT building should be a standard part of this drill package. Lack of this information detracts from the ability of the responders to provide important consequence assessment information to the MFC ECC. Similarly, the lack of experiment specifics in the drill materials detracted from the ability of players to support consequence assessment efforts.

Briefings for the INL Fire Department need to be completed with the MFC station crew that will be participating in the drill. The briefing provided in support of the 6-13-17 drill was with the crew that went off duty before the drill was initiated.

Drill control for operations drills needs to be improved. INL Fire Department players that were out of play were allowed to re-engage. And a drill controller representing the ERO portion of the drill acted as a support for the players by carrying extra batteries for the BED.

Radios used by the responders in the 6-13-17 drill failed to perform as expected or needed. The new batteries provided before the drill initiated did not fix the problem previously identified. This is a repeat problem identified in previous drills and needs to be resolved.

These issues should be evaluated for inclusion in the LabWay issues management system or otherwise solved.

The iMAPs display is a very good response tool in the MFC ECC. Once finalized with configuration management established and trained, it will enhance response capabilities. iMap provides the user with a visual display of facility layouts, roads, utilities and a depiction of the area where protective actions need to be taken.

NWP The Fire Cameras viewing capability is a very good asset in determining event scene impacts from a remote location. The ability to share this information via screen capture or access to the information in the MFC ECC should be on considered.

6. *Records for each drill at the TREAT facility are adequate to demonstrate the effectiveness of completed drills and exercises as well as planning for future drills and exercises. This is demonstrated by the below information.*

Drill records for operational drills run in support of the TREAT resumption of operation were reviewed. Drill package improvements, of the type identified in criteria 5 above are needed. Corrective actions are identified and tracked.

Drill records for ERO drills run in support of TREAT resumption of operation were reviewed. Drill packages were adequate for support conduct of the drills. No corrective actions were identified as needed in the drill reports for these drills. In light of the observations relative to the performance of the ERO

during the 6-13-17 ERO drill, an evaluation of the ERO drill review process at the MFC should be considered.

7. *Operations and operations support personnel at the TREAT facility demonstrate abnormal and emergency event response in emergency exercises, operational drills, tabletop drills and/or field performance demonstrations, including effective interfaces with TREAT facility stakeholders and Emergency Response Organization (ERO). This is demonstrated by the below information.*

During a training drill, run on 6-7-17, that was to present an abnormal plant conditions drills the CRA team identified a problem with the conduct of the evolution and how the expectations of the CRA team were not met. The training drill was run in the TREAT Control Room. Plant operations personnel in the drill included a Rector Operator (RO), and a Senior Reactor Operator (SRO). Any interactions with the TREAT reactor building were simulated by the instructor playing the roll of the In the course of running the training evolution the instructor used TREAT Integrated Exercise Guide SEG5. The scope and activities exceeded the capabilities of single instructor to effectively carry out. Activities that required an interface with the TREAT

During the course of the 6-13-17 operations and ERO drills, the BED established and maintained communications with the MFC EAM to provide information necessary to categorize, classify and determine protective actions for the event. After the TREAT operations crew relocated to the TREAT Control Room a steady line of communications was established with the MFC ECC to maintain event status and to answer requests for additional information. Notwithstanding the problems identified with the EARs not being base-lined against the MFC EALs, and the radio performance problems observed, the performance demonstrated provided assurance the basic processes are in place to support effective interfaces with organizations external to TREAT.

8. *Prerequisites PR-10.1 and PR-10.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

A review of the prerequisites' supporting documentation certified by BEA and submitted in support of PR-10.1 and PR-10.2 was completed. The information was sufficient to determine the prerequisites had been met.

CONCLUSION

The objective was met. One Post-Start finding was identified. Twenty issues were identified for evaluation and resolution in the LabWay issues management system. Two (2) noteworthy practices were identified. Notwithstanding the number of identified issues, the emergency preparedness program implemented in support of the TREAT facility is adequate. Program improvements identified will further strengthen and improve the effectiveness of the program as required by DOE Order 151.1C.

FINDINGS

Pre-Start – None

Post-Start

EP1-POST-1: Contrary to DOE O 151.1C Attachment 2 and EPI-64, The INL Fire Department did not implement an effective incident command, as required by EPI-64 "Incident Command on the INL" Rev 11, at the event scene of the 6-13-17 drill. This is contrary to DOE Order 151.1C Attachment 2 which states "Contractors must develop and implement a Comprehensive Emergency Management System designed to protect the health and safety of all workers and the public from hazards associated with DOE/NNSA operations and those associated with decontamination, decommissioning, and environmental restoration;"

NOTEWORTHY PRACTICES

EP1-NWP-1: The iMAPs display is a very good response tool in the MFC ECC. Once finalized with configuration management established and trained, it will enhance response capabilities.

EP1-NWP-2: The Fire Cameras viewing capability is a very good asset in determining event scene impacts from a remote location. The ability to share this information via screen capture or access to the information in the MFC ECC should be on considered.

Assessed by:	Forest Holmes **CRA Team Members**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Environment, Safety & Health

Functional Area:	Objective: ESH1	OBJECTIVE MET	
Environment, Safety & Health	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

ESH1: Personnel exhibit an awareness of public and worker safety and health and environmental protection requirements and, through their actions, demonstrate a high priority commitment to comply with those requirements.

CRITERIA

1. Line and support managers, supervisors, and workers at the TREAT facility are aware of and understand safety and health requirements and controls that are implemented for TREAT facility operations in order to protect the public, worker, and environment. They also demonstrate a high priority commitment to comply with those requirements.
2. Line and support managers, supervisors, and workers at the TREAT Facility are able to discuss worker's safety and health rights and responsibilities as described in the "INL Worker Safety and Health Program" and the "Integrated Safety Management System Description".
3. Line and support managers, supervisors, and workers understand the processes established and implemented to raise safety concerns without fear of retaliation, are knowledgeable of the established processes, and demonstrate willingness for their use.
4. Line and support managers, supervisors, and workers understand the processes established and implemented to pause or stop work when safety is in question, unexpected conditions are encountered, or procedures cannot be followed as written. They are knowledgeable of the established processes and demonstrate willingness for their use.
5. Prerequisites PR-5.1 and PR-5.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review the INL Worker Safety and Health Program and the INL ISMS description for general familiarization and awareness worker safety and health rights and responsibilities. Review TREAT facility operations procedures for general familiarization and awareness of safety and health hazard requirements and controls associated with reactor operation. Review policies and procedures associated stopping and/or pausing work and raising safety concerns.

Interview the TREAT ESH Manager regarding how ESH programs are in place to implement worker safety and health and environmental protection requirements at the TREAT facility. Additionally ascertain how the organization enables workers' understanding of their safety and health rights and responsibilities.

Interview selected personnel (who manage, oversee, supervise, support, or conduct reactor operations) including senior and middle management, operations and maintenance personnel, and SMP and functional area staff to determine their overall awareness and understanding of safety and health protection

requirements and controls as well as the extent of their commitment to comply with those requirements. Assess their understanding of:

- how they are protected from hazards on their job and their ability to influence the controls provided for protection
- the mechanisms available to them to question safety processes and raise issues and their willingness to use those mechanisms
- Stop Work and Timeout authority and their willingness to use that authority when safety is in question, unexpected conditions are encountered, or procedures cannot be followed as written.

Observe routine and demonstrated performance activities (including pre job briefings) to verify that workers use procedures, understand the safety requirements and controls of those procedures and demonstrate a high-priority commitment to comply with those requirements. Confirm their understanding and demonstrated willingness to raise safety concerns and stop work when safety is in question, unexpected conditions are encountered, or procedures cannot be followed as written.

Reviewer: Joe Biggerstaff

Records Reviewed

- 10 CFR 851, "Worker Safety and Health Program"
- 29 CFR 1904, "Recording and Reporting Occupational Injuries and Illnesses"
- LRD-14700, R3, "Worker Safety and Health: General Program Requirements"
- LST-14700, R3, "Worker Safety and Health: General Program Requirements List"
- LRD-14708, R0, "Worker Safety and Health Occupational Medicine"
- MCP-14500, R1, "Occupational Medicine Program"
- LRD-14001, R9, "Occupational Safety and Health Program"
- LWP-14002, R5, "Timeout and Stop Work Authority"
- MCP-3955, R2, "Conduct of Operations for the TREAT Facility"
- GDE-9201, R0, "Conduct of Operations Guidance for Laboratory Guidance"
- LST-9000, R2, "Conduct of Operations Conformance Matrix"
- SD-49.4.4, R3, "TREAT Operations Roles and Responsibilities
- PDD-171, R2, Contractor Assurance System SP-50.05, R5, Resumption of Transient Testing Program Roles and Responsibilities"
- Lightning Fast response times – poster and spreadsheet
- TREAT Paired Observations, 6/16/16 thru 2/17/17
- Management Observations, 1/1/17 thru 3/31/17
- LWP-14002, R5, "Timeout and Stop Work Authority"
- LabWay by employees (1st Quarter 2017)
- PDD-218, R1, "TREAT Nuclear Facility Training Program"

- LST-718, R14, "Safety Systems at INL Nuclear Facilities"
- PLN-114, R5, "INEEL Emergency Plan/RCRA Contingency Plan"
- LWP-14404, R1, "INL Combustible Loading Program"
- MFC-LI-113, R3, "Maintenance Work Performed at MFC"
- TREAT Operations Organizational Chart, 4/26/17
- SD-49.2.1, R5, "Roles and Responsibilities for TREAT Program Oversight and Assurance and TREAT Training"
- SD-49.4.4, R3, "TREAT Operations Roles and Responsibilities"
- SD-49.6.0, R3, "TREAT Maintenance Roles and Responsibilities"
- PLN-5223, R2, "TREAT Restart Plan"
- MCP-9676, R0, "TREAT Procedure Usage"
- PDD-13000, R6, "Quality Assurance Program Description"
- TREAT-OTP-17-001, R1, TREAT Restart
- ASMT 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity"
- LWP-6500, R8, "Hoisting and Rigging at the INL"
- LRD-14111, R4, "Fall Protection"
- LRD-14110, R3, "Ladders"
- LRD-14005, R2, "Activity Level Hazard Identification, Analysis, and Control"
- LWP-14615, R2, "Confined Spaces"
- LWP-14609, R1, "Controlling and Monitoring Exposure to Noise"
- LWP-14610, R2, "Controlling and Monitoring Exposure to Lead"
- 442.24, R4, "Fall Hazard Prevention Analysis"
- PLN-5146, "Contractor RA Plan of Action for the TREAT Restart of Transient Testing Activity," Memorandum Kinghorn to Broussard, 5/23/17

Interviews Conducted

- TREAT Plant Manager
- Oversight and Assurance Division Director
- OS&H Manager
- Operations Manager
- Deputy Operations Manager
- Industrial Hygiene
- Environmental Support and Services

- Training Manager
- Rad Control Manager
- Industrial Safety
- Radiological Control Training Coordinator
- Training Instructors
- Issues Management
- TREAT Control Technicians
- Transient Control Specialists
- HP Technicians
- TREAT Shift Supervisor
- Quality Engineer
- Engineering Manager
- Experiment Safety Engineering
- Maintenance Manager
- Maintenance Supervisor
- Maintenance Mechanic
- QA Manager/Criticality Safety Manager TREAT Implementation Manager
- Fire Protection Technician
- TREAT Experimental Safety Engineering Manager
- TREAT Safety Analyst
- Project Engineer
- Systems Engineer – Fire Protection
- Systems Engineer – Utilities & Infrastructure Systems
- Fire Protection Engineer (responsible for TREAT)
- Shift Supervisor (2)
- INL Fire Marshal
- Laborers (2)

Evolutions/Operations Witnessed

- Prejob brief and demonstration for Dedicated Microprocessor Tester Operations, TREAT-OI-0509
- Prejob brief and demonstration for TREAT-OI-0507, Transient Operations
- Prejob brief and demonstration of TREAT-OI-0304, Fuel Handling Cask Operations
- Work Order 245986-01, East Roll-up Door Repair

- Building 721 walkthroughs
- Building 720 walkthroughs
- Building 724 walkthroughs
- Weekly Issues Management Meeting
- Daily Maintenance Toolbox and Safety Meeting
- Emergency Drill TRED007P
- Reactor Steady State Operation with Abnormals Demonstration
- Heat Balance demonstration
- Simulated monthly SD-49.8.1, TREAT Facility Inspections using form FRM-1753, and FPE quarterly inspection, June 8, 2017
- Work evolution (tour of Sub-pile Room), June 7, 2017
- Rod Worth Determination demonstration

DISCUSSION OF RESULTS

1. *Line and support managers, supervisors, and workers at the TREAT facility are aware of and understand safety and health requirements and controls that are implemented for TREAT facility operations in order to protect the public, worker, and environment. They also demonstrate a high priority commitment to comply with those requirements.*

Through interviews with TREAT line and support managers, supervisors, front line workers, as well as observation of work activities and demonstrations, the CRA team concluded there is strong evidence that personnel demonstrated awareness of the requirements and controls necessary to resume transient reactor operations while protecting the workforce, public, and environment. High priority to comply with the requirements and controls is exhibited by the workers.

Pre-job briefs observed during this assessment period were excellent and very detailed. Employees were engaged, interacting, and demonstrated understanding of roles and responsibilities through the reverse brief process. Briefing topics included job scope, hazards, controls, responsibilities, abnormal conditions with expected actions, and stop work. Personnel also discussed any previous TREAT lessons learned as well as any documented operational experiences through the nuclear industry as it applied to the task at hand.

During the troubleshooting and repair of the East Rollup Door in the TREAT Low Bay, the Balance of Plant Mechanic operated the Genie Lift with extreme care and excellent situational awareness. When maneuvering the lift on the floor, he was always looking in several directions to ensure no impact with surrounding equipment and structure. During vertical lifts, he was aware of his body position in relation to equipment and structure as he raised and lowered the lift platform. The Mechanic also barricaded the work area and briefed the CRA observer regarding where he should stand and expected communications. He was very conscientious in how he completed his task.

While conducting calibrations and surveillances in the I&C Control Room, the TREAT Control Technicians demonstrated excellent three-way communication while working on low voltage energized systems. They also maintained a clear boundary of their work area by establishing and maintaining the retractable barricade and signage.

2. *Line and support managers, supervisors, and workers at the TREAT Facility are able to discuss worker's safety and health rights and responsibilities as described in the "INL Worker Safety and Health Program" and the "Integrated Safety Management System Description".*

Line and support managers, supervisors, and workers at TREAT were able to discuss safety and health rights and responsibilities as described in the "INL Worker Safety and Health Program and the Integrated Safety Management System Description". This was demonstrated by interviews conducted by the CRA team of a cross section across all organizations. Worker rights and responsibilities for safety and health at TREAT are described in LRD-14700, "Worker Safety and Health: General Program Requirements" and during the interview process, employees indicated they understood their right to perform work in a safe and healthy environment. They also indicated that they can bring up questions or safety concerns at any time, have them addressed by the subject matter expert, and receive management support for resolution. The workers also indicated that their current level of job specific training is sufficient to safely perform assigned tasks. Understanding the core principles of ISMS was also evident during interviews of the workforce. The CRA team concluded personnel embrace the process to ensure work hazards are identified and controlled so work could be performed safely at the activity level.

3. Line and support managers, supervisors, and workers understand the processes established and implemented to raise safety concerns without fear of retaliation, are knowledgeable of the established processes, and demonstrate willingness for their use.

TREAT employees demonstrated through interviews and field observations their knowledge that line, support managers, supervisors, and workers have several avenues, processes, and mechanisms to report safety concerns without fear of reprisal. These include pre-job briefings, job hazard walkdowns, employee concerns program, LabWay submissions, Safety Observations Achieve Results (SOAR), and Employee Safety Teams (EST). Observation of prejob briefs and field activities as well as interviews with personnel indicate that workers understand the requirements and processes for raising safety concerns when conditions change or are uncertain, workability concerns of activity level documents or procedures.

During an interview the Maintenance Manager indicated a program called Pair-to-Pair is in place where management conducts periodic scheduled walk arounds with workers to informally share standards and expectations. A large portion of the time is spent sharing housekeeping and safety standards. The program seems to be well received. Documentation was provided of previous walkdowns and results.

4. Line and support managers, supervisors, and workers understand the processes established and implemented to pause or stop work when safety is in question, unexpected conditions are encountered, or procedures cannot be followed as written. They are knowledgeable of the established processes and demonstrate willingness for their use.

Line and support managers, supervisors, and workers understood the processes and mechanisms established at TREAT to pause or stop work when safety is in question, unexpected conditions are encountered, or procedures cannot be followed as written. This was demonstrated by interviews conducted by the CRA team, attending pre-job briefs, and observation of field activities and demonstrations.

Procedure LWP-14002, "Timeout and Stop Work Authority" adequately describe the processes for the stop work program, including use of the time out process. Interviews with various TREAT line and support managers, supervisors, and workers, as well as observation of work activities, provide strong evidence that personnel understand the requirements and controls necessary to perform transient operations and support activities in a safe and compliant manner, and are willing to pause or stop work when conditions change or are uncertain, or work documents are confusing or cannot be performed as written.

During performance of TREAT-OI-0502, Dedicated Microprocessor Testing, an unexpected condition arose. A timeout was initiated, management notified, and all participants met to discuss this condition and possible path forward. Input was given, from technicians, operators, and management. Technicians were very comfortable discussing troubleshooting techniques with management including direct conversation with the TREAT Director. A path forward was determined and agreed upon by all concerned.

During demonstration of TREAT-OI-0304, Fuel Handling Cask Operations, two separate time outs were initiated by workers performing the evolution. The first involved clarification on rigging signals being given by personnel relocating the load. Rigging activities were paused and the workers discussed with each other to address the concern. After consensus by the workers that adequate clarification was communicated and supervisory concurrence obtained, the job proceeded. The second time out involved plugging a power cord into an outlet over the reactor top that failed to provide power for the optics system. The job was stopped due to this unexpected condition, a path forward discussed, and an alternate power source identified for use.

A noteworthy practice identified was the "Lightning Fast Safety Response Times" posters that are deployed throughout the facility that serve as a good communication device to keep the workforce informed of the status of safety related items, immediate actions, and mitigation as well as time required to have the issue resolved.

5. *Prerequisites PR-5.1 and PR-5.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

A review of evidence packages provided as well as documented memorandum by BEA, PLN-5146, "Contractor RA Plan of Action for the TREAT Restart of Transient Testing Activity," Kinghorn to Broussard, 5/23/17, demonstrate that prerequisites PR-5.1 and PR-5.2 have been met.

Worker safety and health requirements of 10 CFR 851 have been implemented at TREAT. LRD-14700 "Workers Safety and Health Program Requirements" are embedded with 10 CFR 851 required elements. Treat Safety and Health Training, Safety Culture, and Treat Management support and foster an open environment for personnel to raise any health and safety concerns. Management also exhibited a willingness to address concerns in a timely manner.

CONCLUSION

The objective was met. No Findings were identified. One Noteworthy Practice was identified.

Personnel at TREAT exhibit knowledge and awareness of public and worker safety and health as well as environmental protection requirements. Their actions through observance of pre-job briefings, field execution of work, document reviews, and interviews indicate a high priority to comply with the requirements. Sufficient safety and health programs and procedures are in place at TREAT as determined by the CRA team.

FINDINGS

None

NOTEWORTY PRACTICES

ESH1-NWP-1: "Lightning Fast Safety Response Times" posters are deployed throughout the facility and serve as a good communication device to keep the workforce informed on the status of safety related items, immediate actions, and mitigation as well as the time required to have the issue resolved.

Assessed by:	Joe Biggerstaff **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Environment, Safety & Health

Functional Area:	Objective: ESH2	OBJECTIVE MET	
Environment, Safety & Health	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

ESH2: Worker safety and health requirements of 10 CFR Part 851, "Worker Safety and Health Program", have been implemented within the facility. The level of knowledge of managers and staff responsible for worker safety and health is adequate.

CRITERIA

1. Worker safety and health requirements of 10 CFR Part 851, "Worker Safety and Health Program" such as industrial safety, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate procedures, facilities and equipment are available to ensure that the Worker Safety and Health Program , as well as the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs support and services are adequate for safe facility operation
3. Sufficient qualified personnel are available to effectively implement the Worker Safety and Health Program, including the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the Worker Safety and Health Program, and the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs is adequate based on review of records, interviews, and observation of operational demonstrations.

REVIEW APPROACH

Review worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review select TREAT facility operations, maintenance and test procedures to ensure appropriate hazard identification and mitigation and incorporation of worker safety and health requirements in accordance with INL processes (LWP-21220 and LWP -6200)

Review the TREAT SAR-420/TS-420 for provisions associated with worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the worker safety and health, industrial hygiene, occupational medicine, and hazardous material protection related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs at the TREAT facility. These include:

- Management and independent assessment of worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program implementation at the TREAT facility and issues management documentation for issues identified through those assessments
- Presentation material and other documents used to support senior management review of the "health" of worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program implementation at the TREAT facility; including conclusions and assigned actions by senior management
- MSA documentation associated with worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program implementation at the TREAT facility
- Status and documentation of all open and recently closed specific worker safety and health, industrial hygiene, and hazardous material protection program issues, corrective actions, and Lesson Learned at the TREAT facility
- Staffing plans for worker safety and health, industrial hygiene, and hazardous material protection program support at the TREAT facility
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program activities at the TREAT facility
- Procedures associated with worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process
- Completed or in-progress output documentation associated with worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program activities at the TREAT facility to evaluate the adequacy and completeness of the activities.

Interview selected personnel who are involved in performing, supervising, and reviewing worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program activities at the TREAT facility – to confirm their level of knowledge and understanding of worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection program activities at the TREAT facility; related controls and requirements and their implementation; role and responsibility interfaces with TREAT facility operation; and the acceptability of worker health and safety practices and behaviors. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level SMP procedures.

Observe worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection related meetings, pre job briefings and actual work to determine if worker

safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection practices and behaviors demonstrate activities are being conducted safely at the TREAT facility and in a manner that will support and sustain operations. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Confirm sufficient worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection staffing and equipment are available to support operations.

Confirm procedures and work documents that implement worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm that the knowledge of worker safety and health, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection staff and management is adequate and confirm their demonstrated commitment to comply with procedure requirements.

Reviewer: Joe Biggerstaff

Records Reviewed

- 29 CFR 1904, “Recording and Reporting Occupational Injuries and Illnesses”
- 29 CFR 1910.179, “Overhead and Gantry Cranes”
- Manual 14A, “Safety, Fire Protection, Industrial Hygiene”
- DOE-STD-1090, “Hoisting and Rigging”
- NFPA 70E, “Standard for Electrical Safety in the Workplace”
- LRD-14700, R3, “Worker Safety and Health: General Program Requirements”
- LST-14700, R3, Worker Safety and Health: General Program Requirements List
- LRD-14708, R0, “Worker Safety and Health Occupational Medicine”
- MCP-14500, R1, “Occupational Medicine Program”
- LRD-14001, R9, “Occupational Safety and Health Program”
- LWP-14002, R5, “Timeout and Stop Work Authority”
- LWP-6200, R13, “Maintenance Integrated Work Control Process”
- TS-420, R1, “Technical Specifications for the TREAT Facility”
- SAR-420, R1, “Transient Reactor Test (TREAT) Facility FSAR”
- GDE-9201, R0, “Conduct of Operations Guidance for Laboratory Guidance”
- LST-9000, R2, “Conduct of Operations Conformance Matrix”
- MCP-3955, R2, “Conduct of Operations for the TREAT Facility”
- SD-49.4.4, R3, “TREAT Operations Roles and Responsibilities”
- PDD-171, R2, “Contractor Assurance System”
- PDD-218, R1, “TREAT Nuclear Facility Training Program”

- TREAT-OI-0304, R4, “Fuel Handling Cask Operations”
- PLN-5223, R2, “TREAT Restart Plan”
- SP-50.05, R5, “Resumption of Transient Testing Program Roles and Responsibilities”
- M-LI-113, R3, “Maintenance Work Performed at MFC”
- FRM-1753, R0, “TREAT 720 & 724 Facility Zone Monthly Inspection Checklist”
  Dec 2016, Jan 2017, Feb 2017, March 2017
- LWP-6500, R8, “Hoisting and Rigging at the INL”
- PDD-144, “Hoisting and Rigging Training Program”
- LRD-14111, R4, “Fall Protection”
- LRD-14110, R3, “Ladders”
- LRD-14005, R2, “Activity Level Hazard Identification, Analysis, and Control”
- LWP-14615, R2, “Confined Spaces”
- LWP-14609, R1, “Controlling and Monitoring Exposure to Noise”
- LWP-14610, R2, “Controlling and Monitoring Exposure to Lead”
- 442.24, R4, “Fall Hazard Prevention Analysis”
- PDD-218, R1, “TREAT Nuclear Facility Training Program”
- LI-728, R1, “Operating Switches, Disconnects, and Overcurrent Devices”
- WO 229922-01, “RTS Transient Linear Channel Calibrations”
- WO 229923-01, “RTS Transient Energy Channel Calibrations”
- WO 229924-01, “RTS Transient Log/Period Channel Calibrations”
- MWO 106045, “1M TREAT 720 F/C Isokinetic Filter Changeout”
- FHPA # FY16-05, R0, “Miscellaneous Work on the ALT Tower”
- FHPA #FY16-25, R0, “Access TREAT Cask Stand”
- FHPA #FY16-01, R1, “East Roof HVAC PM”
- FHPA #FY16-20, R0, “Repair Manhole Concrete Ring”
- FHPA #FY16-24, R0, “Access Roof to work on N/E HVAC”
- FHPA #FY15-06, R1, “MFC-720 Reactor Top Activity”
- FHPA #FY16-19, R0, “Access Roof to Install Safety Railing”
- FHPA #FY17-03, R0, “MFC-720 Reactor Top North Sliding Guard Railing”
- FHPA #FY16-02, R4, “West Roof HP Office AC”
- FHPA # FY13-22, R7, “15 Ton Overhead Crane”
- FHPA # FY15-03, R3, “TREAT 20T Crane PM-CM”

- HASS #17369.00, “Asbestos Assessment”, 12/8/16
- HASS #17491.00, “Asbestos Removal Assessment”, 12/8/16
- HASS #17406.00, “Basement Air Quality Assessment”, 7/13/16
- HASS #17522.00, “Cement Pour/Vehicle Exhaust Assessment”, 12/8/16
- HASS #17345.00, “Custodian Exposure Assessment”, 8/2/16
- HASS #17275.00, “I&C Summary”, 4/21/16
- HASS #17035.00 , “Lead Assessment”, 12/7/16
- HASS #17517.00, “Lead Paint Samples Assessment”, 12/8/16
- HASS #16974.00 , “Mechanics Summary Exposure Assessment”, 12/8/16
- HASS #17128.00, “Noise Assessment”, 12/8/16
- HASS #16691.00, “Plasma Hearth Piping Removal Assessment”, 12/8/16
- HASS #17513.00 – “Radiography Assessment”, 12/1/16
- LabWays by employees (1st Quarter 2017)
- “Lightning Fast” response times – poster and spreadsheet
- TREAT Paired Observations, 6/16/16 thru 2/17/17
- Management Observations, 1/1/17 thru 3/31/17
- Tailgate training on Using a Power Bloc Device for Circuit Breaker LO/TO, 4/12/16
- All Hands Meetings presentation 10/17/16
- ES&H/IH Weekly Walkdowns, 2/17/17
- EST Meeting Slides, Mar 2017
- EST Meeting Slides, Feb 2017
- EST Meeting Slides, Jan 2017
- EST Meeting Slides, Nov 2016
- TREAT Timely Order #16-07, “New ARC Flash Labeling”, 9/29/16
- TREAT Operations Organizational Chart, 4/26/17
- TREAT Operational Staffing Plan, Memorandum Broussard to Bumgardner, 5/23/17
- PLN-5146, “Contractor RA Plan of Action for the TREAT Restart of Transient Testing Activity,” Memorandum Kinghorn to Broussard, 5/23/17
- ASMT 2017-0628, R0, “Final Report for the Management Self-Assessment for the Readiness”
- For the TREAT Restart of Transient Testing Activity”
- 15 Ton Record 25010 15 Ton Crane Inspection
- 60 Ton Record 4767282 60 Ton Crane Inspection

Interviews Conducted

- Oversight and Assurance Division Director
- OSH Manager
- Operations Manager
- Industrial Hygiene
- TREAT Reactor Operator
- Environmental Support and Services
- Training Manager
- Rad Control Manager
- Maintenance Mechanic
- Industrial Safety
- Radiological Control Technician

Evolutions/Operations Witnessed

- Prejob brief and demonstration for Dedicated Microprocessor Tester Operations, TREAT-OI-0509
- Prejob brief and demonstration for TREAT-OI-0507, Transient Operations
- Prejob brief and demonstration of TREAT-OI-0304, Fuel Handling Cask Operations
- Work Order 245986-01, East Roll-up Door Repair
- Building 721 walkthrough
- Building 720 walkthrough
- Building 724 walkthrough
- Weekly Issues Management Meeting
- Daily Maintenance Toolbox and Safety Meeting
- Emergency Drill

DISCUSSION OF RESULTS

1. *Worker safety and health requirements of 10 CFR Part 851, "Worker Safety and Health Program" such as industrial safety, hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection requirements are implemented at the TREAT facility through* processes *and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.*

Worker safety and health requirements of 10 CFR 851 have been implemented at TREAT. This was demonstrated by documents reviews, interviews, and field demonstrations. LRD-14001, "Occupational Safety and Health Program" and LRD-14700, "Workers Safety and Health Program Requirements" are embedded with 10 CFR 851 required elements. LRD-14700 includes an implementation matrix that flowdown the requirements to ensure compliance with the governing regulations. Worker safety and

health requirements are present at the activity level and incorporated in work control documents and procedures through the integrated work management process where the work scope is defined, hazards and controls are identified, and mitigation processes implemented. Observation of work evolutions and interviews with managers, OSH personnel, support and line managers, supervisors, and workers demonstrate that CFR 851 program requirements are implemented and effective in providing a safe and healthy work environment for TREAT employees.

Industrial Hygiene and Hazardous Material requirements of 10 CFR 851 are addressed and documented in TREAT Manual 14A, "Safety, Fire Protection, Industrial Hygiene." Subprograms are included that address specific topics, such as heat and cold stress, lead, noise, performance of hazard assessments, and hazard communication. Medical services and surveillances at TREAT are addressed and described in MCP-14500, "Occupational Medicine Program". Based on work activity observations, document reviews, interviews, and facility walkdowns, the program procedures are effectively implemented. SME involvement in hazard identification and quantitative assessments are being conducted to implement program requirements. A review of documentation indicated Industrial Hygiene Exposure Assessments (EAs) have been conducted to identify IH hazards. The TREAT training program is documented in PDD-218, "TREAT Nuclear Facility Training Program." It contains processes and requirements ensure workers receive appropriate safety and health training.

Industrial Safety requirements of 10 CFR 851 are addressed in Manual 14A, "Safety, Fire Protection, Industrial Hygiene." Subprogram documents addressing specific topics, such as electrical safety, fall protection, and ladders. Reviews of these documents indicate that the requirements of 10 CFR 851 are adequately flowed down into TREAT procedures and work instructions. Documented Fall Hazard Prevention Analysis (FHPAs) has been conducted by Industrial Safety to evaluate the proper PPE, training, and adequate controls for activities such as overhead crane and cask stand access and stationary ladders.

Hoisting and Rigging program requirements are documented in LWP-6500, "Hoisting and Rigging at the INL" and implements requirements of DOE-STD-1090, *DOE* "Hoisting and Rigging Standard." Training for rigging is implemented through PDD-144 "Hoisting and Rigging Training Program." During the CRA, implementation of the Hoisting and Rigging program was evident. Prior to the Fuel Cask Handling evolution, pre-operational inspection of the crane was performed, and the lifting component was verified to have a current inspection tag. During this demonstration, workers wore proper PPE (e.g., hard hats, safety glasses, and steel-toed shoes) and used safe work practices such as a spotter to ensure the load was controlled and made no unwanted contact with building components or structures.

2. Adequate procedures, facilities and equipment are available to ensure that the Worker Safety and Health Program, as well as the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs support and services are adequate for safe facility operation.

Adequate procedures, facilities and equipment are available and adequate for safe facility restart and operation. This was demonstrated by walkdowns, observations during evolutions, and reviews of procedures.

Housekeeping in the facility is exemplary indicating a management commitment to eliminating hazards and maintaining a clean workplace. Interviews with floor level workers also indicate that all personnel take pride and ownership in the appearance of the plant.

Walkdowns and observations throughout the facility including the reactor floor area and top, control room, sub-pile and hydraulic room, mechanical and electrical rooms, ventilation room, mezzanine levels, and general office and shop areas indicate the plant is well maintained with no apparent material deficiencies.

Observation of rigging devices (wires ropes, slings, and hooks) found all equipment available for use in good condition, and had been inspected per prescribed frequencies in *LWP-6500, "*Hoisting and Rigging at the INL". The overhead gantry cranes located in MFC-720 had current load test documentation to support program adequacy.

During walkdowns, facility spill kits, emergency eyewash stations, AEDs, and radiological decon supplies were observed. All appeared in good working condition and current inspection tags were present. IH and Radcon maintain a sufficient inventory of monitoring equipment to adequately support TREAT operations.

Two unmarked storage cabinets located in MFC-720 along the SE wall that are being utilized for radiological PPE contained custodial cleaning supplies. There were also radiological personnel decon supplies such as shampoo, hand soap, razors, and small towels located in these cabinets. This was corrected by the facility during the CRA by installing "Radcon Supplies" signage on the exterior of the cabinets and removing the custodial supplies.

During execution of hydraulic, air, and filtration cooling system alignments in the field as prerequisites for the Transient Operations demonstration, TREAT-OI-0507, operators were observed utilizing personal cell phone flashlights in order to visually verify component levels or position. Subsequent conversation with the Operations Manager indicated that a requisition for flashlights would be submitted in order to provide personnel site issued flashlights.

During demonstration of Fuel Handling Cask Operations, TREAT-OI-0304, a step ladder was utilized by the rigger to engage and disengage the 15 Ton Crane hook into the top of the cask lifting assembly. Although the rigger maintained 3 point contact with the ladder during this activity, it appeared cumbersome being limited to use of one hand. A post job conversation with the Operations Manager indicated the use of an aerial lift, portable scaffolding, or other approved means to eliminate the use of the ladder would be evaluated and implemented as appropriate. Ladder usage was not identified as a hazard in TREAT–OI-0304. Although *LRD-14005, "*Activity Level Hazard Identification, Analysis, and Control *3.1.1"* states "Activities performed within a routine activity envelop where encountering and mitigation of routine hazards attributable to experience do not need to be documented", the observation of step ladder usage during this work should be considered for inclusion in the risks and controls of this operation.

3. Sufficient qualified personnel are available to effectively implement the Worker Safety and Health Program, including the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the Worker Safety and Health Program, and the hoisting and rigging, industrial hygiene, occupational medicine, and hazardous material protection programs is adequate based on review of records, interviews, and observation of operational demonstrations.

Sufficient qualified and knowledgeable personnel are available to effectively implement the Worker Safety and Health Program. This was demonstrated by record reviews, interviews, and observation of operational demonstrations.

The Operations Manager, Oversite and Assurance Director, OSH Manager, and Radiological Control Manager all reported the current levels of OSH professional and support staff are adequate to ensure implementation of Worker Safety and Health Programs as well as provide day to day support to the facility. Interviews with field workers including Operators, Maintenance, and Rad Control Technicians also indicated sufficient levels of OSH staff are routinely present in the plant to support pre-job work package walkdowns and work.

Written evidence included the current TREAT Operations Organization Chart (4/26/17) and SD-49.44, "TREAT Management Roles and Responsibilities." This standing directive (SD) documents and defines the organizational structure, functional responsibilities, and lines of authority for operation of the Transient Reactor Test (TREAT) Facility. This SD implements the requirement for establishing, implementing, and maintaining the authority and responsibility for safe operation and shutdown of TREAT. An Interoffice Memorandum dated 5/23/17 from the TREAT Plant Manager to the TREAT Director, "TREAT Operational Staffing Plan" indicates a quarterly review will be performed to monitor staffing levels, overtime, and schedules to ensure adequate resources are available and adjustments made as necessary.

During the CRA, OSH representatives was routinely observed in the facility performing work package development walkdowns, watching field activities to ensure procedure compliance, and interacting with the workers to reinforce expectations. Observation of activities during the CRA including Microprocessor Testing, Transient Operations, Fuel Cask Handling, and an emergency drill indicated current levels of OSH resources are adequate to support safe restart and continued operations.

Interviews with OSH individuals indicate a level of knowledge and experience to support the facility and mitigate primary hazards such as rigging, working at heights, and electrical safety. Adequate involvement and analysis of operations have been performed by IH and IS to identify hazards and the output of mitigating controls have been incorporated in procedures and activity level documents work to prevent and monitor unwanted exposures or injuries. TREAT reactor operation process knowledge was also exhibited during questioning. Questioning of IS and IH personnel on the basis for the completed hazard assessments and associated controls appeared technically sound. OSH personnel interviewed exhibited a genuine concern for the safety and health of all personnel in the facility.

IH personnel indicated there remains legacy asbestos and lead based components in the facility primary in caulking, transite panels, and paint. Documented EAs have been conducted prior to and during disturbance, repair and abatement activities. Review of these EAs indicated adequate administrative and engineering controls are prescribed to mitigate and control the hazard during this and future work.

The main execution of rigging activities to support operations is performed by overhead gantry cranes (15 Ton and 60 Ton) operated by hand held pendants. During demonstration of TREAT-OI-0304 Fuel Cask Handling on the floor level as well as relocating the load over the reactor top, observed rigging practices and methods were safe and methodical. Workers involved were deliberate in the operation with numerous pauses of the cask to visually ensure safe unobstructed travel of the load. Personnel maintained safe body position and awareness of the suspended load without placing any body part underneath. Radiological technicians performing periodic surveys during cask lifting and movement used reach tools to obtain contamination smears. A review of current training qualifications indicated the workers involved in the rigging functions were current. "TS-420 Technical Specifications for the TREAT Facility" specify load weights and cask heights be maintained per TS SR 4.4.2.2 and TS SR 4.4.2.1 respectfully. The riggers and job supervisor ensured the weight of the identified cask was verified prior to work commencing as well as visually verifying acceptable load heights were maintained during the job on the floor level as well as during cask movement over the reactor top. Procedure steps were signed off during work indicating completion of these requirements. There are visual painted index points on the reactor top that

are utilized as well as a gauging tool to ensure to load height restrictions are not exceeded. AC 5.10.3.1 directs the cranes shall not be parked over the reactor when not in use. During CRA walkdowns in the facility, both the north and south gantry cranes were observed parked away from the reactor top.

During the Fuel Cask Handling evolution, caution barricades were established on the floor level midway the reactor on the west and east side to prevent unauthorized personnel and to indicate the required PPE to enter. This boundary protected the north side of the floor level but no boundary was established to prevent personnel from walking or standing at the base of the reactor on the south side during Fuel Cask Handling over the reactor. Dropped hand held items from workers on top of the reactor could pose a hazard to unprotected personnel on the floor level on the south side. A follow-up conversation with the Operations Manager indicated concurrence with the observation and future crane evolutions over the reactor top would include the south floor level of the reactor being barricaded at an appropriate distance and PPE requirements established to enter.

During Fuel Cask Handling activities on top of the reactor, two separate 8” diameter open penetrations were observed along the south side in the area where personnel were traversing. These penetrations could pose a tripping or foot injury if stepped in advertently. This was brought to the attention of the job supervisor who immediately pointed out the penetrations to the workers with verbal instructions to be cognizant of the opening. This was corrected by the facility during the CRA with installation of a cover plate.

During performance of procedure TREAT-OI-0702, R7, TREAT Hydraulic Systems, step 5.1.1.4 states “Ensure the TRD 480V disconnect (10-DSC-1914) is in the open position.” The worker donned arc flash PPE per the requirements of LI-728 Operating, Switches, Disconnects, and Overcurrent Protection Devices Rev 1, prior to manipulating the breaker, however TREAT timely order # 16-07, “New Arc Flash Hazard Labeling”, 9/29/16, requires components with no Arc Flash Energy label affixed to contact the Electrical Engineer for determination of PPE and qualification level to operate the component. This particular disconnect has no label and the Electrical Engineer was not contacted prior to manipulation. A review of the timely order sign off roster indicated the employee performing the field manipulation had not been briefed or signed off on this requirement. Training records indicate the worker had the appropriate level of electrical training to manipulate this particular component. Conversations with the Operations Shift Supervisor and Maintenance Supervisor indicate some confusion exists on which employees this particular standing order is applicable for. Only some operations personnel had reviewed the timely order and no electricians had documented a review. The Electrical Engineer stated the reason all breakers and disconnects are not currently labeled is that updated incident energy exposure level (IEEL) modeling is in process as well as the corresponding database. Attention should be given to better defining the target audience and ensuring prompt review and sign off this timely order as well as completion of the IEEL modeling and component labeling.

During a facility walkdown two 480V disconnects (720-10-DSC-1308 and 720-10-DSC-1309) located beside the west roll door inside MFC-720 has a shield block stand located with the 42” required boundary of the face of these components contrary to NFPA 70E , 110.26-27, “Standard for Electrical Safety in the Workplace.” The shield block stand is approximately 29” away from the disconnects. Compensatory measures were implemented during the CRA with a barricade and signage to contact the Shift Supervisor prior to entry of this area and a requirement to use an insulating blanket over the stand prior to operating the disconnects. A follow-up conservation with the Maintenance Implementation Manager indicates walkdowns and package development will be conducted to relocate the shield block stand.

CONCLUSION

This objective was met. No findings or noteworthy practices were identified. Worker safety and health requirements of 10 CFR Part 851 “Worker Safety and Health Programs” have been implemented at

TREAT. LRD-14700, “Workers Safety and Health Program Requirements” are embedded with 10 CFR 851 required elements. LRD-14700 includes an implementation matrix that flowdown the requirements to ensure compliance with the governing regulations. Worker safety and health aspects are incorporated into the activity level through the integrated work management process where work scope is defined, the hazards and controls identified, and mitigating processes implemented. Current SMP implementation of the Health and Safety program established at TREAT supports safe accomplishment of reactor restart and continued operations, while protecting employees, the public, and environment from negative impacts. Reviews of current staffing levels, observations during field activities and interviews with Operations and OSH management support that an adequate number of qualified personnel are available to ensure safe operations and implement the Worker Safety and Health Program.OSH staff are knowledgeable of the TREAT processes and have the technical skills to recognize, analyze, and implement controls to protect the workers. Interviews were conducted concerning roles and responsibilities for TREAT restart and continued operations as well as fundamental discipline knowledge, TREAT specific procedures, and hazard identification and incorporation into procedures and activity work control documents. OSH personnel understood their role in the protection of workers as did Operations management taking overall ownership of the program. Adequate procedures, facilities, and equipment are available to ensure the Worker Safety and Health Programs are sufficient. Walkdowns and visual observations throughout the facility indicate housekeeping is above average and systems are well maintained.

FINDINGS – None

NOTE WORTY PRACTICES – None

Assessed by:	Joe Biggerstaff **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Fire Protection

Functional Area:	Objective: FP1	OBJECTIVE MET	
Fire Protection	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

FP1: Line management has established and implemented a Fire Protection (FP) SMP to ensure safe accomplishment of work. The level of knowledge of FP managers and staff is adequate.

CRITERIA

1. Fire protection requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that the fire protection processes and procedures support safe facility operation with adequate services.
3. Sufficient qualified personnel are available to effectively implement fire protection processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the fire protection processes and procedures at the TREAT facility is adequate based on review of records, interviews, and observation of operational demonstrations.
4. An approved Fire Hazard Analysis (FHA) is established and implemented.
5. Commitments Compensatory Measures and Conditions of Approval associated with Fire Protection Exemptions and Equivalencies are effectively implemented.

REVIEW APPROACH

Review fire protection program procedures and the FHA to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with emergency preparedness

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the fire protection related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of fire protection processes and procedures at the TREAT facility. These include:

- The Fire Hazards Analysis (FHA)
- Fire Protection requirement exemptions, equivalencies, commitments, compensatory measures and conditions of approval
- Procedures for fire system inspection test and maintenance (IT&M) completed fire system IT&M paperwork or “travelers” and any corrective actions or reports

- Fire department pre-incident plans
- Hot work procedures
- Fire related training plans
- Engineered design documentation related to sprinkler systems, fire barrier installation, alarm systems, and life safety systems
- Management and independent assessment of fire protection implementation and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of fire protection implementation; including conclusions and assigned actions by senior management
- MSA documentation associated with fire protection implementation.
- Status and documentation of all open and recently closed specific fire protection issues, corrective actions, and Lesson Learned.
- Staffing plan for fire protection support.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing fire protection program activities.
- Fire protection procedures to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed and in-progress output documentation and records associated with fire protection activities (FHA, incident plans, preventative maintenance, any required in place tests or inspections, etc.) to confirm the adequacy and completeness of fire protection activities.

Interview selected personnel who are involved in performing, supervising, and reviewing fire protection activities to confirm their level of knowledge and understanding of fire protection related systems, controls and requirements and their implementation and confirm their role and responsibility interfaces with the operations organization. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures. Personnel interviewed will include: Fire Marshal, Fire Protection Engineer, Systems Engineers, select Alarm Technicians, Facility Manager and Operations Manager, select Shift Supervisors and Reactor Operators, Maintenance Supervisor, an Evacuation Warden, and select Hot Work Qualified individuals.

Observe fire protection related meetings, pre job briefings and work in the field to validate fire protection activities are being conducted safely and in a manner that will support and sustain operations. Observations of fire protection program systems and equipment for design adequacy, fire barriers installation and access for mobile fire apparatus will be conducted. During facility walk downs selected maintenance and instrumentation work activities, such as; fire barrier inspections, sprinkler inspections, or fire alarm testing will be observed. Observation of fire protection related maintenance activities could include hot work, fire watch or the dispensing/use of a flammable or combustible liquid. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Confirm sufficient fire protection staffing and equipment are available to support operations.

Confirm procedures and work documents that implement fire protection requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm that the knowledge of the fire protection staff and managers is and confirm their demonstrated commitment to comply with procedure requirements.

Reviewer: D. Allan Coutts

Records Reviewed

- SAR-420, Rev. 1, "Final Safety Analysis Report for the Transient Reactor Test Facility," February 2017.
- 747207, "MFC Fire Alarm Upgrade," Rev. 3, April 13, 2016.
- MWO 229897, 1Y TREAT-720 – Hydraulic Oil Mist Detector Calibration.
- Q24131701, 1Y TREAT-720 – Hydraulic Oil Mist Detector Calibration, February 15, 2017.
- SDD-488, "System Design Description, Materials and Fuels Complex, Fire and Potable Water System," Rev. 0, November 21, 2016.
- LWP-14407, "Managing Fire Protection Impairments", Rev. 6, July 16, 2015.
- MFC-2017-0015, "Fire Protection Impairment Tag," March 28, 2017.
- PRD-14406, "Welding, Cutting, and Other Hot Work," Rev. 0, September 1, 2016.
- PS-OI-56, "MFC-707 Diesel Driven Fire Pump Operation", Rev. 3, June 21, 2016.
- TREAT Timely Order # 17-04, BAR Access Requirements, May 31, 2017.
- SD-49.8.1, "TREAT Facility Inspections," Rev. 2, March 29, 2017.
- FRM-1753, Rev. 0, "TREAT 720 & 724 Facility Zone Monthly Inspection Checklist," August 20, 2015.
- MWO 220445 (generic), 1Y TREAT Fire Door Inspection.
- MWO 114969 (generic), 4Y TREAT 720 Reactor Fire Dampers Maintenance,
- PDD-14401, Rev. 1, "INL Fire Protection Program," September 8, 2016.
- PRD-14401, Rev. 0, "INL Fire Protection Program," September 29, 2016.
- OPEXShare records for the current year through May 17, 2017.
- FSA-MFC-720-2016, Rev. 0, Fire Safety Assessment Form,
- IAS151270, Transient Reactor Test (TREAT) Facility Baseline Data Analysis Review of Identified Conditions / Issues, April 28, 2015.
- IAS16976, Transient Reactor Test (TREAT) Facility Data Analysis Review of Identified Conditions / Issues, January 4, 2016.
- ASMT 2016-0761, Rev. 0, "Final Report for Management Self-Assessment for Readiness to Implement TREAT SAR-420 and TS-420," October 6, 2016.
- Q24235201, PM Traveler – 4Y TREAT 720 Reactor Fire Dampers Maintenance, March 21, 2017.
- SD-49.4.7, TREAT Combustible-loading Program, April 11, 2017.

- PS-OI-56, Rev. 3, "MFC-707 Diesel Driven Fire Pump Operation," Competed June 30, 2016.
- SPC-2197, Rev. 0, "MFC-720 TREAT Penetration Fire Stop Repair Project", January 19, 2017.
- Q24235201, "4Y TREAT 720 Reactor Fire Dampers Maintenance," March 21, 2017.
- TREAT EAR-001, Rev. 5, "Emergency Information and Procedures," May 30, 2017.
- MFC-720 "Quick Access Plan," March 1, 2016.
- "Fire Department Pre-Incident Plan," MFC-720 TREAT Reactor Building, March 2016.
- TREAT-OI-0507, Rev. 3, "Transient Operations," May 23, 2017.
- From Richard B. Provencher to Mark T. Peters, Authority Having Jurisdiction Approval for Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches Equivalency Request (IFM-16-002), January 20, 2016.
- CCN 237147, from Carolyn S. Mascareñas, to Richard Provencher, Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches, December 8, 2015.
- CCN 234398, from Carolyn S. Mascareñas, to Richard Provencher, DOE-ID, Increase of Occupant Load in MFC-720 Basement Equivalency Request, December 9, 2014
- CCN 236912, from Carolyn S. Mascareñas, to Richard B. Provencher, DOE-ID, Lack of Fire Suppression in Building MFC-720 High Bays Exemption Request, 10/30/2015.
- To Mark T. Peters, Battelle Energy Alliance, Authority Having Jurisdiction Approval for Lack of Fire Suppression in Building MFC-720 High Bays Exemption Request (IMF-16-007), 2/29/16
- DOE-ID-FPEQ-03-06/NFPA IT&M Frequency Cross Reference List, LST-817, Rev. 2, 09/15/14.
- ICP CCN 316863 and INL CCN 233950, to Richard B. Provencher, Approval of the Revised Fire Protection Equivalency for the Inspection, Testing, and Maintenance Extended Frequencies, 9/15/14.
- EM-NSP-14-061, From Richard B. Provencher, to Thomas J. Dieter, CH2M-WG Idaho; and John J. Grossenbacher, Battelle Energy Alliance, Approval of the Revised Fire Protection Equivalency for the Inspection, Testing, and Maintenance Frequencies (EM-NSP-14-061) 11/17/14.
- To John J. Grossenbacher, Authority Having Jurisdiction Approval for Equivalency Request to Increase of Occupant Load in MFC-720 Subpile Room and Basement Auxiliary Room (IFM-15-003), February 3, 2015.
- MWR 2017-3168, Treat Fire Door D-3389 closure needs adjustment, June 9, 2017.
- FRM-1549, Rev. 3, Shift Supervisor Pre-Transient Check Sheet, May 24, 2017.
- IAS16772, Transient Reactor Test (TREAT) Facility Data Analysis Review of Identified Conditions / Issues, October 1, 2015.
- TREAT Management Review Meeting (MRM) and Key Performance Indicator (KPI) Report, First Quarter FY 2017, February 2017.
- TREAT Key Performance Indicator (KPI) Report, Fourth Quarter FY 2016, November 2016.
- TREAT Key Performance Indicator (KPI) Report, Third Quarter FY 2016, August 2016.
- Transient Reactor Test (TREAT) Facility System Readiness Binder, System 17, Fire Protection System, March 19, 2017, Rev 3.

- eCR 641284, HAD-470, Transient Rector Test (TREAT) Facility Fire Hazard Analysis – MFC-720 Complex, July 12, 2016.
- MCP-14401, Rev. 2, "Performing Fire Hazards Analysis," September 1, 2016.
- TRED007P, Evacuation with Contaminated Injured Person, June 9, 2017.
- Form 220.33, Rev. 1, (generic) Fire Safety Assessment Form, August 26, 2016.
- MCP-14403, Rev. 3, "Performing Fire Safety Assessments," September 1, 2016.
- TRED007P, Rev. 0, TREAT Drill Guide – Evacuation with a Contaminated Injured Person, May 24, 2017.
- TREAT 720 & 724 Facility Zone Monthly Inspection Checklist (FRM-1753), January 30, 2017.
- TREAT 720 & 724 Facility Zone Monthly Inspection Checklist (FRM-1753), February 28, 2017.
- TREAT 720 & 724 Facility Zone Monthly Inspection Checklist (FRM-1753), March 28, 2017.
- TREAT 720 & 724 Facility Zone Monthly Inspection Checklist (FRM-1753), April 24, 2017.
- TREAT 720 & 724 Facility Zone Monthly Inspection Checklist (FRM-1753), May 31, 2017.

Interviews Conducted

- TREAT Maintenance Implementation Manager
- TREAT System Engineer
- Fire Protection Technician
- TREAT Experiment Safety Engineering Manager
- TREAT Safety Analyst
- TREAT Plant Manager
- Project Engineer
- Systems Engineer – Fire Protection
- Systems Engineer – Utilities & Infrastructure Systems
- Fire Protection Engineer (responsible for TREAT)
- Shift Supervisor (2)
- INEL Fire Marshal

Evolutions/Operations Witnessed

- Tour of MFC-720 on May 24, 2017
- Simulated monthly inspection per SD-49.8.1, TREAT Facility Inspections using form FRM-1753, and FPE quarterly inspection, June 8, 2017
- Work evolution (tour of Subpile Room), June 7, 2017
- Drill – Evacuation with a Contaminated Injured Person, June 13, 2017

DISCUSSION OF RESULTS

1. *Fire protection requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.*

This was demonstrated by a comparison between the upper-tier INL procedures with the fire protection program requirements in NFPA 801 (i.e., horizontal review), and implementation evaluations of the key facility-specific program elements in NFPA 801 (i.e., vertical review of selected elements).

The site-level fire protection program is described in PDD-14401, Program Description Document INL Fire Protection Program, and established by PRD-14401, INL Fire Protection Program Requirements. The PRD is based on requirements in DOE Order 420.1C, Change 1, Facility Safety and DOE-STD-1066-2012, Fire Protection. To evaluate the comprehensiveness of the fire protection program, PRD-14401 was evaluated using the program requirements established in NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, section 4.3. This NFPA standard is invoked by DOE Order 420.1C. Nineteen of the twenty elements in NFPA 801:4.3 are addressed in PRD-14401. The one exception was element 1, management and policy direction. This element is addressed by PDD-14401 as discussed in the next paragraph.

NFPA 801, paragraph 4.1.1 requires that "the policy document designate the senior management position with immediate authority and responsible for the fire protection program." The Fire Marshal indicated that the Director of OSH fulfills this role. Section 4.3 of PDD-14401 lists the R2A2s for program implementation, but does not list the Director of OSH. Section 4.2, Management and Administration, is clear in that the INL OSH Program is responsible for establishing the Fire Protection Program. As such, NFPA 801:4.1.1 is judged to be fulfilled.

Based on this evidence (previous two paragraphs), the fire protection program requirements are judged to be adequately captured in the upper-tier program documents.

To evaluate if the requirements from these two documents (PDD-14401 and PRD-14401) are implemented through the INL Fire Protection Program, twelve of the twenty program elements from NFPA 801 were evaluated. These elements were selected based on their significance to fire safety and the need for facility-specific implementation:

- Dissemination of fire safety information (Element 5)
- Documented facility inspections (Element 6)
- Description of general housekeeping practices (Element 7)
- Control of flammable and combustible liquids and gases (Element 9)
- Control of ignition sources (Element 10)
- Restrictions on smoking (Element 11)
- Inspection, testing and maintenance (IT&M) of fire protection features (Element 12)
- Impairment processes (Element 13)
- Emergency response (Element 16)
- Pre-incident fire plans (Element 18)
- Quality assurance and self-auditing (Element 19)

- Adequate staff and training (Element 20)

Dissemination of fire safety information (Element 5) Interviews with TREAT facility staff and fire protection program staff, in addition to the mandatory facility access training for the CRA Team demonstrate that employees and contractors are provided with the appropriate fire safety information to assure timely reporting of fires.

Documented facility inspections (Element 6) A monthly facility inspection is performed by the Facility Manager or his designate per procedure SD-49.8.1, "TREAT Facility Inspections," using form FRM-1753. Concurrent with these inspections, the FPE performs a quarterly inspection. Inspection records for January through May 2017 were reviewed with a focus on Activity 4 (i.e., fire safety). There were minimal indications of noncompliances identified during these reviews. Efforts were made to locate LabWay entries for two specific "excess material" (item 30) noncompliances. In January the issue was "Need general pickup, check floors, shelves, horizontal surfaces for wire, washers, screws and general items." In February the issue was "Sandbags can be removed from building." LabWay entries were not available for these issues; rather interviews indicated that the issues were addressed by informal requests.

A simulation of the fire safety portion (Activity 4) of this quarterly inspection was observed by the CRA team on June 8, 2017. Two items of note were observed: (1) The fire door between the high-bay and Room 121 intermittently did not latch on closure and (2) Room 120 (Hodoscope) room was cluttered and the means of egress was impeded. The first item was added to LabWay to initiate repair (MWR 2017-3168). This is supposed to be the normal practice for actual walkdowns. The second item is the result of an on-going effort to remove antiquated equipment. This effort had been placed on-hold during the CRA Team review. The overall impression of the facility is very positive; housekeeping was good with no accumulations of excessive combustibles.

Description of general housekeeping practices (Element 7) SD-49.4.7, TREAT Combustible-loading Program, includes a description of the general housekeeping practices that are implemented in TREAT. Multiple entries by the CRA Team indicated that the TREAT facility has implemented these housekeeping practices.

Control of flammable and combustible liquids and gases (Element 9) SD-49.4.7, "TREAT Combustible-loading Program," includes specific requirements for the control of flammable and combustible liquids and combustible gases. Multiple entries by the CRA Team and the facility walkdown by the CRA Team FPE identified no inappropriate handling of such materials.

Control of ignition sources (Element 10) Interviews with the Work Planning and other staff indicated that processes have been established and implemented to manage hot work as required by NFPA 801:4.3 (i.e., PRD-14406, Welding, Cutting, and Other Hot Work.) The facility walkdown by the CRA Team FPE identified no inappropriate use of electrical extension cords and no systematic shortcomings associated with the control of other ignition sources.

Restrictions on smoking (Element 11) Smoking within the TREAT building is prohibited (PRD-14401, paragraph 3.4.15.3). Smoking outside of the facility is limited to designated locations. Multiple entries by the CRA Team indicated that the TREAT facility has implemented this element.

Inspection, testing and maintenance of fire protection features (Element 12) Interviews with TREAT facility staff and fire protection program staff, in addition to a review of selected IT&M records for fire protection features demonstrated that this requirement has been adequately implemented.

During a facility walkdown on June 8, 2017 the sprinkler system risers on the east and west side of the building were inspected. The hydraulic design information sign required by NFPA 25:5.2.6 was not present. The requirement for such a sign existed in both the 2011 and 2014 versions of NFPA 25. The

requirements were enhanced in 2014 to include a provision to replace missing or illegible signs. The 2011 version does not contain a corrective action. Interviews (technician, FPE) indicate that INL is transitioning to fully implement the 2014 version of NFPA 25. The missing nameplate will not affect the functionality of the sprinkler system. It is expected that the situation will be addressed through the ongoing inspection, testing and maintenance program for fire protection systems.

Impairment processes (Element 13) Interviews with fire protection maintenance staff indicated that the processes established in LWP-14407, Managing Fire Protection Impairments, are being implemented. In addition, a review of the procedure and supporting impairment records supports the conclusion that the NFPA 801:4.5 impairment program requirements have been successfully implemented.

Emergency response (Element 16) The required facility-specific actions in the event of a fire or similar event are described in TREAT-EAR-001, "Emergency Information and Procedures." The TREAT CRA Team has evaluated emergency response in criteria EP-1. For additional detail see Emergency Response discussion under Criterion 2.

Pre-incident fire plans (Element 18) A pre-incident plan for the MFC 720 TREAT Reactor Building has been prepared. It is supplemented by a Quick Access Plan. For additional detail see Emergency Response discussion under Criterion 2.

Quality assurance and self-auditing (Element 19) NFPA 801 requires that the fire protection program include "quality assurance and self auditing of the" program activities (NFPA 801:4.3). At INL, this is implemented through the PRD-14401. The quality assurance is to "be provided in accordance with the requirements of applicable laboratory quality assurance program requirements" (PRD-14401, paragraph 3.4.12). A comprehensive fire protection programmatic assessment is required every 3 years (PRD-14401, paragraph 3.11.1) and other fire safety assessments are to be performed in accordance with MCP-14403 (PRD-14401, paragraph 3.11.2). Evidence provided to the TREAT CRA Team that demonstrated these programmatic commitments is limited to:

- IAS151128, MFC-720 (TREAT) Combustible Loading Walkdown, October 27, 2015
- IAS151270 Transient Reactor Test (TREAT) Facility Baseline Data Analysis Review of Identified Conditions / Issues, April 28, 2015.
- IAS16976, Transient Reactor Test (TREAT) Facility Data Analysis Review of Identified Conditions / Issues, January 4, 2016.

The quality assurance and self-auditing process as it relates to fire protection is weak.

Adequate staff and training (Element 20) Interviews with TREAT facility staff and fire protection program staff, in addition to a review of selected IT&M records for fire protection features, and facility walkdowns demonstrated that this requirement has been adequately implemented.

2. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that the fire protection processes and procedures support safe facility operation with adequate services.

This was demonstrated by a combination of personnel interviews, document reviews, and facility walkdowns, recognizing that the program implementation assessment (Criteria #1) demonstrates procedure adequacy for routine fire protection actions. As such, the focus was on adequacy of fire protective features and emergency response plans.

Means of Egress

The general building arrangement provides multiple means of egress that fulfill life safety requirements. Since much of the building is an RBA, ropes have been draped across doors that lead out of the RBA. The

purpose to prevent incorrect exiting of the RBA. Since the ropes are readily removable, the intent of NFPA 101, Life Safety Code, is fulfilled. There are several doors in TREAT that have been provided with hasps to facilitate preventing entry into rooms that are potentially High Radiation Areas (related to reentry following a reactor transient). This hardware is inconsistent with NFPA 101:7.2.1.5.1 “Door leaves shall be arranged to be opened readily from the egress side whenever the building is occupied.” This topic is not addressed in the FHA and is a life safety deficiency that should be addressed.

FP1-D-1: Controls should be implemented for hasps that are mounted on TREAT facility doors or the hasps should be removed to assure compliance with NFPA 101:7.2.1.5.1.

The MFC-720 basement has two exits. One is a ladder with a hatch located at the top. (See Criteria #5 for increase in occupant load equivalency.) Interviews indicate that this hatch is not subject to inspection to assure that it will open on demand. This is a weakness in the maintenance efforts associated with means of egress and should be corrected.

Water Supply

Fire protection water for the TREAT facility is provided from the MFC through a combined fire and potable water system. It is operated and maintained by the Utilities and Infrastructure Group. SDD-488 indicates that the largest TREAT fire water demand is 1500 gpm (1000 gpm sprinkler flow and 500 gpm hose allowance). This information is consistent with the information in the FHA.

The most recent version of the MFC-707 annual fire protection water pump (PS-OI-57) was reviewed to evaluate the effectiveness of fire system IT&M. It was possible to reproduce the speed correction for the discharge pressure and the flow rate from the IT&M record. It was not possible to reproduce the percent rated capacity values from the record. Discussions with the system engineer clarified the pump system condition. Currently the pump is functioning at 94.2 percent of nameplate rating (4000 gpm) and runout (6000 gpm). Based on this discussion the nameplate discharge values are 100 and 81.5 psi respectively and the current discharge values corrected for test speed were 94.2 and 76.8 psi, respectively. NFPA 25:8.3.7.4 requires that “degradation in excess of 5 percent of the pressure of the initial unadjusted acceptance test curve or nameplate shall require an investigation to reveal the cause of degraded performance.” Since the current results demonstrate a degradation in excess of 5 percent, further investigation is warranted. While further investigation is warranted, the extent of the degradation, and the recognition that there is a second fire protection water pump, supports a judgement that no significant programmatic concern exists.

Fire Barriers

There is significant work in progress to upgrade fire barriers. The planned configuration will result in fire rated walls for the east side of the high-bay area, and the walls separating Rooms 112, 111, 121, 113 and 115 (SPC-2197). The CRA Team FPE walkdown confirmed the need to upgrade the fire barriers (e.g., add penetration seals where piping and conduit penetrate the walls), but recognized that the current compliance level is consistent with many DOE facilities that are of similar age as TREAT. Addressing the deficiencies is appropriate, but the extent of the deficiencies is judged to result in no concern that would impact current plans to restart TREAT.

The current deficiencies are being tracked as a MFC-generic Fire Protection Impairment (MFC-2017-0015). This impairment was originally opened January 18, 2017 with an expiration date of February 17. Extension number 2 was approved on March 28, with an expiration date of June 29, 2017. The necessary compensatory measures for this impairment were transmitted by e-mail from Matthew Krawczyk to David Broussard, et.al., on January 23, 2017. The deficiencies for the 14 wall segments are described in an attachment to this e-mail. The attachment also indicated the necessary compensatory measures for each wall segment. Typically the measure was “No transient combustibles within a 3 foot radius of the subject

penetration." Interviews with the Shift Supervisors, who are in the position to assure that the compensatory measures are maintained, indicate a good understanding of the measures both in terms of their detail and importance. This reinforces the position that the current deficiencies create no concern that would impact current restart plans.

The timing of the barrier repair efforts is (from interviews):

- Engineering work request issued (EWR-6769): October 18, 2016
- Davis-Bacon approval (D-B INL-16-274) October 21, 2016
- Engineering specification issued (SPC-2197) January 19, 2017
- USQ screen (SWUSQ20070020) February 7, 2017
- Initial fire stop approved (CFP-027) March 13, 2017
- Fire stop work awarded (CFP-033) April 24, 2017

This timeline demonstrates an aggressive effort to upgrade the fire barriers as compared to similar efforts at other DOE sites.

Fire dampers are an integral component in some of the TREAT fire barriers. To evaluate the adequacy of the IT&M on these barriers, Work Order Q24235201 was evaluated. This work order was based on MWO 114969, 4Y TREAT 720 Reactor Fire Dampers Maintenance. The work order and procedure will accomplished the requirements in NFPA 80:19.5 (Periodic Testing – Fire Dampers, 2016), except that the procedure does not indicate that "fusible links or other moveable parts shall not be painted or coated, unless listed by the testing agency" (NFPA 80:19.5.2.2.2). While not desirable, a painted fusible link would only delay fire damper operation. Given the minimal combustible loading at the TREAT facility the potential that painted links would create a significant risk, is judged negligible.

Emergency Response

TREAT-EAR-001 includes 16 abnormal conditions; condition 5 addresses fires and explosions. For most operating modes this procedure is judged to be sufficient to address such events. The procedure is consistent with the Fire Department Pre-Incident Plan for MFC 720 TREAT Reactor Building and the MFC-720 Quick Access Plan.

The Quick Access Plan indicates that "All pink containers are suspect radiation." During the CRA Team FPE walkdown no pink containers were observed and containers holding radioactive material were observed on the second-level mezzanine and the Californium-containing drums on the floor of the high-bay area. The Quick Access Plan does not reflect the hazards associated with transient reactor operations. It should be revised to include discussion of this hazard.

The Fire Department Pre-incident Plan indicates that the water supply to TREAT is deficient (i.e., Water Tender response is required). The interview with the Fire Marshal indicated that this deficiency has been addressed by the recent upgrade to the potable/fire protection water system. The floor plan for the building is also outdated; it still shows the recently dismantled room that existed in the south high-bay. The pre-incident plan also notes special salvage concerns associated with the Hodoscope Room. Given the current facility efforts to remove equipment from this room, this notation should be revisited. In addition, the pre-incident plan does not discuss the hazards associated with transient reactor operations.

The TREAT facility represents a unique emergency response consideration during transient operations. Fire Department operations readily address response to both occupied and unoccupied structures. With the exception of the transient operations, the fire hazards associated with TREAT are consistent with current INL Fire Department response protocols. During transient operations the building is unoccupied

and key status information that should be available to the Fire Department Incident Commander (i.e., Shift Supervisor knowledge of facility status) is remote from the building (i.e., at MFC-724, TREAT Control Building). Discussions with the INL Fire Marshal reinforce that the unique aspects of the transient operation should be addressed by the Fire Department Pre-incident Plan.

TREAT-OI-0507, Transient Operations, includes a step for the Shift Supervisor to verify all personnel have evacuated MFC-720 and the TREAT Exclusion Zone (MFC-723). There is also a step to establish a barricade control at the Control Building road. Once the prerequisites are complete, the Reactor Mode Switch can be placed in the TRANSIENT ENABLE position (Step 5.8.4). Until the Reactor Mode Switch position is changed (Step 5.8.13.5 for a successfully completed transient, and Step 5.8.5.1 if the ARCS is not operating properly), a reactor transient may be initiated. While the Reactor Mode Switch is in the TRANSIENT ENABLE position, personnel should not approach the TREAT Exclusion Zone. In addition, following a successful transient, Step 5.8.16 requires a 5-minute delay prior to MFC-720 reentry. Interviews with the Shift Supervisors indicate that if a fire event indication occurs while the Reactor Mode Switch is placed in the TRANSIENT ENABLE position, TREAT-EAR-001 will be implemented, and would direct that the reactor be placed into a "safe" configuration. (i.e., Step 5.2.1 requires that "If reactor shutdown is required THEN SCRAM the reactor, OR SHUTDOWN the reactor per … TREAT-OI-507.") While the interviewees indicated that appropriate actions would be fulfilled, the crispness of the answers were not consistent with the rapid decision process that might be necessary should a fire occur.

When MFC-720 is occupied, standard practice is for operations personnel to meet the Fire Department at the Exclusion Zone gate. The primary purpose for this interaction is to transmit to the Incident Commander if all building occupants have been accounted for and the hazard status within the building. While in transient operations, this meeting needs to occur at the Control Room barricade. This permits development of a reentry strategy based on the most current facility configuration and information.

Interviews indicate that the TREAT Control Room (MFC-724) does not currently receive fire alarm information. As such, while conducting a reactor transient activity, the first indication of fire might be Fire Department arrival at the Control Building barricade. Interviews indicate that actions have been initiated to address this condition.

Based on the evidence presented the CRA Team concludes that:

- Revision of TREAT-OI-0507, Transient Operations, should be considered to include a notification to the Fire Alarm Center (i.e., Dispatcher) to ensure that timely information is available should a fire alarm indication or fire event occur while TREAT is in transient mode. In addition, tabletop exercises, or similar methods, should be used to demonstrate that applicable procedures are consistent and can be successfully executed.
- The fire department preplan does not reflect the hazard associated with transient operations. The preplan should be revised to reflect this operation mode. The preplan is the training tool to familiarize response personnel with the hazard. In addition, the preplan should be updated to reflect the current facility configuration and fire protection water supply upgrades.

The update of the Fire Department preplans, addition of a notification step in TREAT-OI-0507, and practice in demonstrating emergency response capabilities during transient operations are desirable risk reduction steps. The TREAT CRA Team judged that while these enhancements should be implemented, it is not a finding because the current procedures and planned actions (i.e., manned gate at Control Room Building) should prevent unacceptable impact on the safety of personnel (i.e., Fire Department responders). Additional discussion on the topic of Fire Department effectiveness is presented in EP-1.

FP1-D-2: The Fire Department preplan, TREAT-EAR-001, and TREAT-OI-0507 Transient Operation procedure, do not sufficiently ensure Fire Department response personnel safety when the TREAT facility is in Transient Mode.

3. *Sufficient qualified personnel are available to effectively implement fire protection processes and procedures in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the fire protection processes and procedures at the TREAT facility is adequate based on review of records, interviews, and observation of operational demonstrations.*

This was demonstrated through interviews with personnel responsible for the IT&M of fire protection systems, TREAT facility staff interviews, document reviews and facility walkdowns.

There are two technicians responsible for the IT&M of fire protection systems. In addition, there is reach-back capability within the Life Safety Group to provide surge capability should the scheduled workload be excessive or require additional resources. Interviews with the Shift Supervisors indicate that the Life Safety Group is very responsive for implementing planned impairments and will make every effort to support impairments that were not adequately addressed in the work planning process.

Document reviews and interviews indicate that experienced fire protection technical staff is retiring. Efforts to recruit replacement personnel have been effective, and the current staff is able to maintain the fire protection program.

4. *An approved Fire Hazard Analysis (FHA) is established and implemented.*

An FHA for the MFC-720 Complex was published as of July 26, 2016, however it was not possible to demonstrate that the FHA meet the requirements of NFPA 801, section 4.2. The adequacy of the FHA was evaluated through a combination of interviews, document inspections and walkdowns as described below.

The FHA was consistent with the facility configuration observed during the CRA Treat FPE walkdown, the documentation and interview evidence. In addition, the FHA was initially issued in 2014 and revised in 2016 so has been reviewed on the required 3-year cycle (NFPA 801:4.2.1).

The FHA is judged to "consider the facility's specific design, layout, and anticipated operating needs" (NFPA 801:4.2.2). However, the FHA does not reflect the fire wall deficiency and upgrade effort described in Criteria #2. Barriers are described in Section 6.9, Passive Barriers. The phrasing in the FHA creates uncertainty in understanding the status of the barriers. (e.g., "Penetrations through the fire barriers are expected to be sealed with UL listed and/or FM approved assemblies in order to maintain acceptable fire barriers. Where fire barriers are penetrated by ventilation ducting, fire dampers are used to maintain barrier integrity, unless ventilation system operation is required to control the spread of contamination.")

The FHA does not address some of the hazards present in TREAT (NFPA 801:4.2.3). Examples are:

- The FHA does not discuss the potential for a fire involving the exposed graphite reflector blocks or the graphite-carbon rod/fuel elements. Since the DSA paragraph 3.3.1.9 indicates that the graphite reflector is "adequately protected against fire by the limit on the maximum fuel temperature encountered in the reactivity insertion DBA and paragraph 4.2.2.4.3 indicates that the concreate shielding structure is "capable of functioning as a fire shield against fires outside the reactor" the lack of a graphite analysis in the FHA is not considered a finding.
- The FHA does not discuss fire exposure to reactor component assemblies while in their storage configuration or during transfer. Based on the low combustible loading observed during the CRA Team FPE walkdown no significant risk is judged to exist.

- While the FHA did describe the potential for combustible metal fires involving sodium, zirconium fires were not discussed. Nor did the FHA address compliance with NFPA 484, Standard for Combustible Metals. Based on the low combustible loading and open spaces observed during the CRA Team FPE walkdown no significant safety risk is judged to exist.

Except as noted in the previous paragraph, the FHA addressed all areas of the facility (NFPA 801:4.2.4).

The FHA does not describe some of the radioactive materials present in the facility, as such, the adequacy of the fire protection for these materials is not evaluated (NFPA 801:4.2.5). Examples are:

- The below-floor fuel elements
- The californium in Type A shipping packages
- Miscellaneous storage on the second-tier mezzanine

Given that the DSA has demonstrated that TREAT is consistent with the DOE release exposure guidelines, this topic is not considered a finding.

With the exception of sodium, the FHA does not mention any other hazardous materials (NFPA 801:4.2.5). The fire hazard associated with sodium is addressed in the FHA. (See comment above on NFPA 484 for an understanding of the adequacy of the analysis.) Evidence presented to the TREAT CRA Team supports the conclusion that other hazardous materials are not present.

The FHA does not indicate the author of the document. NFPA 801:4.2.6 requires that a fire hazards analysis shall be prepared by or under the supervision of a qualified fire protection engineer. The electronic change request, eCR 641284, does not indicate the individual who fulfilled this role. As such, it is not possible for an accessor to judge if this requirement has been met. This represents a weakness in the fire protection program implementation. Based on a review of the FHA and other documents, personnel interviews, and the CRA Team FPE walkdown, this topic is not considered a finding and no significant safety risk is judged to exist.

NFPA 801:7.5 has five requirements that are unique to research and production reactors; they were not discussed in the FHA. These requirements and why the lack of FHA text was judged by the CRA Team to not be a finding are:

- “Reactivity control shall be capable of inserting negative reactivity to achieve and maintain subcritical conditions in the event of a fire” (NFPA 801:7.5.1). The DSA indicates that “Control rods provide reactivity control” (paragraph 1.2.2) so this topic is not considered a finding and no significant safety risk is judged to exist.
- “Inventory and pressure control shall be capable of controlling coolant level such that fuel damage as a result of a fire is prevented” (NFPA 801:7.5.2). Based on the design of the reactor, this particular requirement is judged to be not applicable to the TREAT facility.
- “Decay heat removal shall be capable of removing heat from the reactor core such that fuel damage as a result of fire is prevented” (NFPA 801:7.5.3). The DSA discusses that natural convection cooling will provide the necessary long-term cooling (SAR-420, paragraph 15.1.6.4) so no significant safety risk is judged to exist.
- “Vital auxiliaries shall be capable of performing the necessary functions in the event of a fire” (NFPA 801:7.5.4). The FHA does indicate that there is no vital equipment in the TREAT complex (FHA section 5.5.1), however it is unclear if the FHA nomenclature is consistent with the NFPA 801 nomenclature. In DOE FHAs, vital typically refers to facilities and equipment vital to a DOE mission. In NFPA 801, vital refers to SSCs vital to the adequate functioning and safe operation of the facility.

Based on the conclusions of the DSA this topic is not considered a finding and no significant safety risk is judged to exist.

- "Process monitoring shall be capable of providing the necessary indication in the event of a fire" (NFPA 801:7.5.5). Interviews indicate that key process monitoring information is provided with emergency power, however a fire-response evaluation of key process monitoring SSCs has not been performed. Based on the conclusions of the DSA this topic is not considered a finding and no significant safety risk is judged to exist.

Finding FP1-POST-1: Contrary to the requirements established in DOE-STD-1066-2012, NFPA 801, PRD-14401, and MCP-14401, the TREAT Facility Fire Hazard Analysis for the MFC-720 Complex does not present a comprehensive assessment of the fire hazards present in the complex.

5. *Commitments Compensatory Measures and Conditions of Approval associated with Fire Protection Exemptions and Equivalencies are effectively implemented.*

This is demonstrated through evaluation of the compliance with the applicable conditions of approval. The evidence supporting the evaluation is described below:

Four equivalencies were identified based on interviews and document reviews:

- Increase of Occupant Load in MFC-720 Basement (IFM-15-003 and CCN 234398)
- Lack of Fire Suppression in Building MFC-720 High Bays (IFM-16-007 and CCN 236912)
- Modification to NFPA IT&M Frequencies (EM-NSP-14-061, LST-817, ICP CCN 316863 and INL CCN 233950)
- Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches (IFM-16-002 and CCN 237147)

Increase of Occupant Load in MFC-720 Basement (IFM-15-003)

The MFC-720 Subpile Room and Basement Auxiliary Room (BAR) rely on a fire escape ladder to fulfil the required second means of egress. Where a fire escape ladder is used, occupancy is typically limited to 3 persons to fulfill compliance with NFPA 101. This equivalency provides for an increase in the occupant load to support maintenance activities and permit tours of the Subpile Room. The equivalency, as modifies by the DOE approval letter, requires all of the following controls be in place when occupancy in the Subpile Room and BAR exceeds three, but not to exceed 10 persons:

- Permission shall be granted by the Shift Supervisor
- All individuals shall be capable of using the ladder in the event of an emergency
- Restrict all hot work performed in the building
- Restrict all work involving flammable liquids in the building
- (As modified by the DOE approval letter.) An individual shall be posted at the entry to the stair on the main floor to inform the occupants of any occurrences that would warrant their evacuation and shall have a means of communication (radios or other means) for alerting the occupants. The individual shall not perform duties or tasks that would detract from the duty of monitoring and informing the occupants of a fire or similar emergency. Additionally, the individual shall have a means of tracking the number of occupants in the basement to ensure that they all exit safely and are accounted for in the event of a fire or similar emergency.

- Automatic suppression in the basement shall be in service
- (As modified by the DOE approval letter.) If the automatic suppression system in the basement is impaired, the number of people in the basement cannot be increased above three persons without permission of the Fire Marshal, or their designee, and the NE-ID Fire Protection Engineer.

The above controls are implemented by TREAT Timely Order # 17-04, BAR Access Requirements. Attached to this order are the DOE approval letter and the contractor request (CCN 234398). A work evolution (tour of Subpile Room) was observed to evaluate execution of the timely order. Implementation of the Timely Order was accomplished using 11 color-coded badges clipped to a cord that may be attached to a magnetic surface. The SS designated a trained individual to fulfill the role of a BAR tender. This individual clipped the applicable badge to their lanyard, and provided each individual entering the basement a sequentially numbered (1 through 10) badge. The tender then provided verbal instructions to the six visitors covering the applicable topics in the Timely Order. During the evolution it was necessary for the tender to contact the visitors using the paging system, which was the required communication method discussed in the verbal instructions. This successful action demonstrated the effectiveness of the paging system in fulfilling the communication requirement. When the tour exited the basement the tender collected the badges accounting for the six tour members, attached them to the cord, and returned them to the SS.

The DOE approval letter modified two of the controls, thus the Timely Order contains two requirement lists (i.e., the original list and the modifications in the approval letter). This increase the potential for the individual implementing the Timely Order to overlook some of the requirements. As such, the priority established for replacement of the Timely Order with an implementing procedure should account for this shortcoming.

FP1-NWP-1: The badge-based method to maintain entry limits when personnel must enter the basement is a noteworthy practice that fulfills the necessary controls to manage life safety risks.

Lack of Fire Suppression in Building MFC-720 High Bays (IFM-16-007)

The MFC-720 high bay areas are not provided with automatic sprinkler protection. DOE has approved an equivalency for this condition. The required controls include a video fire detection system and combustible controls. The combustible controls consist of:

- Quarterly walkdowns by the Facility FPE to supplement the monthly operations walkdowns and minimization of transient combustible materials
- Control and minimization of flammable and combustible liquids to levels established in facility-specific procedures
- Restrictions on the use of flammable gases
- Specific combustible loading limits, designed to minimize transient combustible materials in the facility, controlled through facility-specific procedure and walk downs
- Operations management approval prior to bringing gas or diesel powered vehicles into the south high bay.
- A prohibition for fossil-fueled vehicles entering the north high bay, unless specific compensatory measures, as identified by the FPE, are in place.

Review of combustible loading procedures, interviews with the Shift Supervisors and the TREAT CRA FPE walkdown demonstrate that the required controls have been successfully implemented. To simplify

implementation, the more restrictive controls directed to the north high bay are being applied to both the south and north high bays.

The DOE approval of the exemption specifically stated, "Any change in mission, facility operations, or conditions will require reevaluation of this exemption." The exemption was dated February 29, 2016, which is after the Environmental Assessment for Resumption of Transient Testing of Nuclear Fuels and Materials (DOE/EA-1954, February 2014), so restart of TREAT is assumed to be within the scope of the exemption.

Modification to NFPA IT&M Frequencies (DOE-ID-FPEQ-03-06)

An equivalency has been established for INL that allows extended inspection and testing frequencies for fire suppression and fire detection systems. The extended frequencies are specified in the DOE-ID approved equivalency, Inspection Testing and Maintenance Frequencies (DOE-ID-FPEQ-03-06).

The provision includes an "annual review of the applicable" NFPA code and standard IT&M frequencies to "determine if an additional revision to the equivalency is warranted." This action is considered a site-level program action, so was not evaluated by the TREAT CRA Team.

Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches (IFM-16-002)

The reactor transient rod drives and compensation rod latches both require the use of a non-fire rated hydraulic fluid. This is inconsistent with NFPA 801:7.1.1.7, which requires the use of fire-resistant hydraulic fluids. Since such a fluid could not be obtained, DOE authorize the use of a non-fire rated hydraulic fluid based on the use of an oil mist detection system that is designed to:

- automatically activate the fire alarm system
- provide an alarm in the TREAT Control Room
- terminate operation of the transient rod drive hydraulic supply pumps

The oil mist calibration was most recently performed on February 15, 2017 (MWO 229897, WO No. Q24131701). The work order was signed by Work Representative/Craftsman, System Engineer and Operations on February 2, February 6 and February 13 indicating the equipment will perform its intended function and SSC is acceptable for continued service. On alarm this system will shutdown the hydraulic pumps in the Basement Auxiliary Room and initiate transmission of a fire alarm to the INEL Central Station. While this is not a listed system, the lack of listing is sufficiently addressed by the DOE-approved equivalency for the use of a non-fire resistive hydraulic fluid (IFM-16-002).

CONCLUSION

The objective was met. One Finding was identified. Two deficiencies and one Noteworthy Practice were also identified. Implementing procedures are in place to ensure consistent execution of the fire protection SMP and the TREAT facility staff is proactively executing the implementing procedures. While repairs can be made to the fire barriers, the needed changes are consistent with older DOE facilities and an active project is addressing these weaknesses. There is an approved and implemented Fire Hazards Analysis for the TREAT facility; unfortunately there are multiple noncompliances in the document. This condition is considered to be a Finding because of the multiple analysis gaps. The Finding was judged Post-Start based on the gaps being addressed in the DSA or other supporting documents and no significant safety risks existed. The resumption of transient reactor operations introduces a unique hazard that requires update to Fire Department planning documents and the TREAT emergency plans. Changes will be necessary to improve the safety of emergency responders while TREAT is in a Transient Mode; this topic is considered a deficiency. In addition, tabletop exercises, or similar methods, should be used to

demonstrate that applicable procedures are consistent and can be successfully executed during transient operations. A recent physical change, the addition of hasps on several doors to support reentry following a reactor transient, creates a non-compliance with NFPA 101:7.2.1.5.1. Controls will need to be established to assure means of egress are maintained when the building is occupied. While this deficiency represents a weakness in the SMP, the CRA Team concluded that line management has implemented the FP SMP and is working to strengthen the SMP as weakness are identified.

FINDINGS

Pre-Start – None

Post-Start

FP1-POST-1: Contrary to the requirements established in DOE-STD-1066-2012, NFPA 801, PRD-14401, and MCP-14401, the TREAT Facility Fire Hazard Analysis for the MFC-720 Complex does not present a comprehensive assessment of the fire hazards present in the complex.

Deficiencies

FP1-DEF-1: Controls should be implemented for hasps that are mounted on TREAT facility doors or the hasps should be removed to assure compliance with NFPA 101:7.2.1.5.1.

FP1-DEF-2: The Fire Department preplan, TREAT-EAR-001, and TREAT-OI-0507 Transient Operation procedure, do not sufficiently ensure Fire Department response personnel safety when the TREAT facility is in Transient Mode.

NOTEWORTHY PRACTICES

FP1-NWP-1: The badge-based method to maintain entry limits when personnel must enter the basement is a noteworthy practice that fulfills the necessary controls to manage life safety risks.

Assessed by:	D. Allan Coutts **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Management

Functional Area:	Objective: MG1	OBJECTIVE MET	
Management	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

MG1: Line management has established and implemented Safety Management Programs (SMPs) to ensure safe accomplishment of work. The level of knowledge of SMP managers and staff is adequate.

CRITERIA

1. Configuration Management (TS AC 5.7.1); Emergency Preparedness[a] (TS AC 5.7.2 and POA CR1); Fire Protection (TS AC 5.7.3 and POA CR1); Hazardous Material Protection (TS AC 5.7.4); Maintenance (TS AC 5.7.5 and POA CR1); Nuclear Criticality Safety (TS AC 5.7.6 and POA CR1); Quality Assurance (TS AC 5.7.7 and POA CR1); Radiation Protection (TS AC 5.7.8 and POA CR1); Unreviewed Safety Questions (TS AC 5.7.9); Hoisting and Rigging (TS AC 5.7.10) Personnel Training (POA CR1)[b]; Conduct of Operations (POA CR1); Procedures Management (POA CR1 and TS AC 5.5.1); and Waste Management (POA CR1) SMPs are established and implemented to include:
   - Each SMP is implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
   - Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that each SMP supports safe facility operation with adequate services
   - Sufficient qualified personnel are available to effectively implement each SMP in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing each SMP at the TREAT facility is adequate based on review of records, interviews, and observation of operational demonstrations.
2. Senior management's key expectations for safe work performance at the TREAT facility, including SMP administration and implementation, are appropriately established, understood and demonstrated by workers and managers.
3. Senior management at the TREAT facility appropriately champions safe and effective implementation of SMP activities and fosters both a compliant and performance based focus on SMP activities to drive effective implementation.
4. Management awareness of SMP related issues and shortcomings at the TREAT facility are in evidence at all levels of the organization. Managers are visible at the worksite monitoring work performance and providing feedback and reinforcement of expectations. In addition, appropriate forums are chartered and implemented at the TREAT facility, for senior management review and

[a] Whilst referred to as Emergency Management in TS AC 5.7.2, it is referred to as Emergency Preparedness in the Plan of Action and accordingly, this CRAD.

[b] Whilst referred to as Personnel Training in the Plan of Action, it is referred to as Training and Qualification in this CRAD

evaluation of activities affecting safe performance of work, including periodic review of the "health" of SMP implementation.

5. Prerequisites PR-1.1, PR-1.2, PR-1.3, PR-1.4, and PR-1.5 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

The first two criteria will be addressed by analyzing, consolidating and documenting the collective results and conclusions of Objectives CM1 (configuration management), EP1 (emergency preparedness), FP1 (fire protection), ESH2 (hazardous material protection and hoisting and rigging), MTI1 (maintenance), CS1 (nuclear criticality safety), QA1 (quality assurance), RP1 (radiological protection), SB1 (unreviewed safety question), TQ1 (training and qualification), OPS1 (conduct of operations), WM1 (waste management), PM1 (procedures management).

The remaining three criteria will be addressed through documentation reviews associated with: senior management key expectations and issue awareness and performance improvement forums and charters; interview of select personnel (who manage, oversee, supervise, support, or conduct reactor operations) including senior and middle management, operators, maintenance personnel, SMP and functional area staff; and observation of performance demonstrations, drills, and meetings.

Reviewer: All with Sam Glenn lead

Records Reviewed

- ASTM 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity", 05/08/2017
- PDD-1004, R17, "Integrated Safety Management System", 05/20/2016
- SD-49.4.4, R3, "TREAT Operations Roles and Responsibilities"
- PDD-171, R2, "Contractor Assurance System"
- CTR-396, R5, "TREAT Facility Safety Operations Review Committee", 04/17/2017
- CTR-399, R4, "TREAT Operations Review Committee", 03/30/2017
- 10 CFR 851, "Worker Safety and Health Program"
- Memorandum, J.R. Biggs to D.J. Broussard, Subject: "PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity", 05/25/2017
- Memorandum, L.W.Kinghorn to D.J. Broussard, Subject: "PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity", 05/23/2017
- LRD-14700, R3, "Worker Safety and Health: General Program Requirements"
- LST-14700, R3, "Worker Safety and Health: General Program Requirements List"
- LRD-14708, R0, "Worker Safety and Health Occupational Medicine"
- MCP-14500, R1, "Occupational Medicine Program"
- LRD-14001, R9, "Occupational Safety and Health Program"
- LWP-14002, R5, "Timeout and Stop Work Authority"
- LWP-6200, R13, "Maintenance Integrated Work Control Process"

- TS-420, R1, "Technical Specifications for the TREAT Facility"
- SAR-420, R1, "Transient Reactor Test (TREAT) Facility FSAR"
- GDE-9201, R0, "Conduct of Operations Guidance for Laboratory Guidance"
- LST-9000, R2, "Conduct of Operations Conformance Matrix"
- MCP-3955, R2, "Conduct of Operations for the TREAT Facility"
- PDD-218, R1, "TREAT Nuclear Facility Training Program"
- TREAT-OI-0304, R4, "Fuel Handling Cask Operations"
- PLN-5223, R2, "TREAT Restart Plan"
- SP-50.05, R5, "Resumption of Transient Testing Program Roles and Responsibilities"
- M-LI-113, R3, "Maintenance Work Performed at MFC"
- FRM-1753, R0, "TREAT 720 & 724 Facility Zone Monthly Inspection Checklist Dec 2016, Jan 2017, Feb 2017, March 2017"
- LWP-6500, R8, "Hoisting and Rigging at the INL"
- PDD-218, R1, "TREAT Nuclear Facility Training Program"
- LI-728, R1, "Operating Switches, Disconnects, and Overcurrent Devices"
- FHPA # FY16-05, R0, "Miscellaneous Work on the ALT Tower"
- HASS #17369.00, "Asbestos Assessment", 12/8/16
- HASS #17491.00, "Asbestos Removal Assessment", 12/8/16
- HASS #17406.00, "Basement Air Quality Assessment", 7/13/16
- HASS #17522.00, "Cement Pour/Vehicle Exhaust Assessment", 12/8/16
- HASS #17345.00, "Custodian Exposure Assessment", 8/2/16
- HASS #17275.00, "I&C Summary", 4/21/16
- HASS #17035.00 , "Lead Assessment", 12/7/16
- HASS #17517.00, "Lead Paint Samples Assessment", 12/8/16
- HASS #16974.00 , "Mechanics Summary Exposure Assessment", 12/8/16
- HASS #17128.00, "Noise Assessment", 12/8/16
- HASS #16691.00, "Plasma Hearth Piping Removal Assessment", 12/8/16
- HASS #17513.00, "Radiography Assessment", 12/1/16
- LabWays by employees (1st Quarter 2017)
- Lightning Fast response times – poster and spreadsheet
- TREAT Paired Observations, 6/16/16 thru 2/17/17
- Management Observations, 1/1/17 thru 3/31/17

- Tailgate training on Using a Power Bloc Device for Circuit Breaker LO/TO, 4/12/16
- All Hands Meetings presentation 10/17/16
- ES&H/IH Weekly Walkdowns, 2/17/17
- EST Meeting Slides, Mar 2017
- EST Meeting Slides, Feb 2017
- EST Meeting Slides, Jan 2017
- EST Meeting Slides, Nov 2016
- TREAT Timely Order #16-07, New ARC Flash Labeling, 9/29/16
- TREAT Operations Organizational Chart, 4/26/17
- TREAT Operational Staffing Plan, Memorandum Broussard to Bumgardner, 5/23/17
- PLN-5146, "Contractor RA Plan of Action for the TREAT Restart of Transient Testing Activity", Memorandum Kinghorn to Broussard, 5/23/17
- ASMT 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness For the TREAT Restart of Transient Testing Activity"

Interviews Conducted

- TREAT Director, Resumption of Transient Testing Program
- Chief Operating Officer, Resumption of Transient Testing Program
- TREAT Plant Manager
- TREAT Oversight and Assurance Division Director
- TREAT Quality Assurance Manager
- TREAT Radiological Controls Manager
- TREAT Occupational Safety and Health Manager
- TREAT Emergency Planning Manager
- MFC Radiological Controls Manager
- Duty MFC Emergency Action Manager
- OS&H Manager
- Operations Manager
- Industrial Hygiene
- TREAT Operators (2)
- Environmental Support and Services
- Oversight and Assurance Division Director
- Training Manager
- Maintenance Mechanic

- Industrial Safety
- Radiological Control Technician

Evolutions/Operations Witnessed

- Prejob brief and demonstration for Dedicated Microprocessor Tester Operations, TREAT-OI-0509
- Prejob brief and demonstration for TREAT-OI-0507, Transient Operations
- Prejob brief and demonstration of TREAT-OI-0304, Fuel Handling Cask Operations
- Field work for Work Order 245986-01, East Roll-up Door Repair
- Building 721 walkthrough
- Building 720 walkthrough
- Building 724 walkthrough
- Weekly Issues Management Meeting
- Daily Maintenance Toolbox and Safety Meeting
- Emergency Drill

DISCUSSION OF RESULTS

1. *Configuration Management (TS AC 5.7.1); Emergency Preparedness (TS AC 5.7.2 and POA CR1); Fire Protection (TS AC 5.7.3 and POA CR1); Hazardous Material Protection (TS AC 5.7.4); Maintenance (TS AC 5.7.5 and POA CR1); Nuclear Criticality Safety (TS AC 5.7.6 and POA CR1); Quality Assurance (TS AC 5.7.7 and POA CR1); Radiation Protection (TS AC 5.7.8 and POA CR1); Unreviewed Safety Questions (TS AC 5.7.9); Hoisting and Rigging (TS AC 5.7.10) Personnel Training (POA CR1) ; Conduct of Operations (POA CR1); Procedures Management (POA CR1 and TS AC 5.5.1); and Waste Management (POA CR1) SMPs are established and implemented to include:*

   • Each SMP is implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.

   • Adequate procedures, facilities and equipment are available at the TREAT facility to ensure that each SMP supports safe facility operation with adequate services

   • Sufficient qualified personnel are available to effectively implement each SMP in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing each SMP at the TREAT facility is adequate based on review of records, interviews, and observation of operational demonstrations.

Based on reviews of applicable programmatic and TREAT implementing documents, interviews, and observation of selected demonstrations, the review team concluded safety management programs (SMP) are adequately implemented at TREAT to support safely restarting the facility. The team determined that, with limited exception, laboratory wide SMP program requirements are flowed into facility specific procedures and SMP procedures are effectively implemented in support of facility operations and support activities. Facilities and equipment at TREAT were demonstrated to be adequate to support safe operations. Sufficient qualified personnel are available to implement each SMP effectively in support of the facility.

Review team members evaluated SMPs during assessments performed for each Objective applicable to an SMP. The results of the subject assessments are summarized below; issues identified for each Objective are captured in the appropriate sections of this report.

Configuration Management - Overall, the TREAT CM approach meets the DOE Standard for this SMP consistent with the hazards analysis of the TREAT Facility. Through the Laboratory Policy a formal approach is established that endorses the use of CM and the Facility has documented the process in its local procedures. Key roles and responsibilities are defined, as are the structures systems and components. Each system has an established CM plan that identifies interfaces and graded approach application. Involved individuals are knowledgeable about the activities.

Emergency Preparedness - Efforts to integrate the TREAT specific aspects into the MFC EM program are ongoing. While the MFC EM program is compliant with DOE O 151.1C and the INL RCRA Permit, there remain activities specific to the TREAT facility which need improvement. The INL EM program has a comprehensive training, drill, and exercise program that helps ensure responders at INL are prepared and demonstrate the capability to protect the workers and the public. A strong set of procedures implementing the INL emergency plan provides for a consistent response to a wide variety of initiating event conditions. The MFC ECC offers responders the tools needed to carry out their responsibilities effectively during operational emergencies postulated by the MFC EPHA.

Fire Protection - The Fire Protection SMP has been successfully implemented in TREAT. This has been demonstrated by document reviews, interviews and observed activities. The INL site-level program was shown to capture all elements of a comprehensive fire protection program. In addition, the TREAT CRA Team selected 12 key fire protection program elements and identified evidence that these elements have been implemented at the facility level. While improvements can be made to selected program elements (e.g., FHA comprehensiveness, fire preplans, emergency planning), the Fire Protection SMP is judged to be sound and adequate to support restart of TREAT.

Hazardous Material Protection - A Hazardous Material Protection SMP is in place to ensure safe accomplishment of work and adequate protection of workers, the public, and environment while operating TREAT. Reviews of staffing levels, observations of field activities, and interviews demonstrate an adequate number of knowledgeable and qualified personnel are available to ensure safe operation of TREAT.

Maintenance – The review team concluded TREAT has implemented an effective maintenance program to support restart of facility operations. Personnel interviewed and observed are adequately trained, qualified, and proficient to perform their jobs and their level of knowledge is commensurate with their level of responsibility.

Nuclear Criticality Safety - As evidenced by documents reviewed and interviews an effective Nuclear Criticality Safety Program been established and implemented at TREAT. TREAT management has demonstrated support for the program by instituting an annual program inspection of all criticality control areas and quarterly performance reviews as part of management review meetings. Results of these inspections and quarterly reviews were evaluated and indicate proactive management actions to identify issues or degradations prior to an event or occurrence.

Quality Assurance - The TREAT Quality Assurance Program was evaluated through a combination of personnel interviews, document reviews, and observations, and found to be sufficiently implemented to support TREAT restart activities. The review team concluded sufficient and compliant program documents, procedures, and processes are in place. There are adequate personnel, facilities, and equipment to support quality program requirements based on interviews with Quality Assurance and Operations personnel.

Radiation Protection - The Radiological Control SMP is satisfactorily implemented in TREAT processes and procedures. Workers' knowledge of these procedures and processes, including laboratory wide procedures is exceptional. Sufficient equipment, facilities, and personnel are available to accomplish the TREAT mission. The knowledge level of Radiological Control personnel is exceptional.

Unreviewed Safety Questions - TREAT uses the INL unreviewed safety question procedure. Interviews and document reviews demonstrate that TREAT personnel are adequately trained and knowledgeable of the process requirements. While the quality of several individual USQ evaluations could be improved, the review team concluded that USQs are performed when required and the process is satisfactorily implemented at TREAT.

Hoisting and Rigging – TREAT has implemented an effective SMP to ensure hoisting and rigging evolutions are accomplished safely and meet applicable SAR and Technical Specification requirements. Minor personnel safety issues identified by the review team were acknowledged by TREAT and are being corrected.

Personnel Training - A Training and Qualification SMP is satisfactorily implemented at TREAT. Sufficient training program personnel are available to accomplish the TREAT mission. The knowledge level of training personnel is adequate based on interviews and observations.

Conduct of Operations - TREAT personnel successfully demonstrated discipline and formality of operations sufficient to safely operate the TREAT facility. Conduct of operations and oversight programs are in place to ensure personnel maintain this formality and discipline and proficiency of disciplined operations.

Procedures Management - A Procedures Management SMP is approved and in place to ensure safe accomplishment of work and adequate and accurate procedures are in place for operating TREAT. Procedure Management requirements are implemented through processes and procedures consistent with laboratory wide requirements and ensure the latest revision to documents are used to control and perform work. The level of knowledge of managers and staff responsible for administering and implementing procedures management is adequate.

Waste Management – TREAT line management has implemented a Waste Management SMP incorporating laboratory wide requirements to ensure safe accomplishment of work. The level of knowledge of program managers and staff is adequate based on interviews, review of qualification records, and observation of operational demonstrations. Adequate qualified personnel, facilities and equipment are available to ensure that WM support and services are adequate for safe facility operation.

2. Senior management's key expectations for safe work performance at the TREAT facility, including SMP administration and implementation, are appropriately established, understood and demonstrated by workers and managers.

Interviews were conducted with managers and staff during work activities (e.g., Demonstrations, scheduled meetings, etc.), in small groups, and in one-on-one sessions. Additional evidence was obtained through observation of operational demonstrations, facility maintenance, and operator facility rounds.

Interviews and observations confirmed managers and staff are engaged and able to demonstrate competence, responsibility, and accountability for safe and effective work performance. Appropriate to their positions, TREAT staff articulated how safety expectations translated to their particular jobs. The employees also demonstrated a strong commitment to meet those expectations. For example, operations, maintenance, and radiological controls personnel, interviewed and observed during evolutions, demonstrated adequate knowledge of SMPs applicable to the work they were performing. Supervisors observed and interviewed were aware of potential hazards and ensured workers implemented required

controls. The review team concluded all levels of management are interactively involved in TREAT restart preparations and senior management has communicated and reinforced that safety is a top priority.

TREAT workers were able to clearly describe their responsibility to pause or stop work when safety or technical questions are discovered. The team also concluded that TREAT management strongly supported workers who identified issues and called for a pause or stop work. It was evident based on interviews and observation that workers are closely involved in the planning and execution of work. The work processes observed were consistent with TREAT management's stated expectation that everyone is responsible for their own safety and the safety of others. Implementation of management's expectations was apparent during all observed demonstrations or work in TREAT.

The team also reviewed TREAT's results from INL's FY2017 "Leadership, Engagement, and Safety Survey". The survey showed TREAT's scores to be higher than the Laboratory-wide mean in all areas including: mutual understanding of performance expectations; managers' first priority is safety; being comfortable questioning others when something appears to be incorrect; and workers' trust there will not be repercussions for reporting injuries or mistakes. The results of this survey are also extremely important to the team's evaluation of Criteria 3 and 4 below.

3. Senior management at the TREAT facility appropriately champions safe and effective implementation of SMP activities and fosters both a compliant and performance based focus on SMP activities to drive effective implementation.

Based on multiple observations of work activities and demonstrations, and extensive interviews, the review team concluded TREAT senior managers are closely involved in TREAT restart preparations and senior management has communicated and reinforced that safety is the top priority.

Interviews and observations of work activities showed that managers, supervisors, and workers (including support organizations) are aware of and understand management's key expectations for safe work performance, including SMP integration. Multiple work activities were observed to assess this criterion, and interviews were conducted with all levels of the workforce throughout the review. All TREAT personnel could effectively describe how applicable SMPs are implemented and their role in ensuring the programs are effective. The site-wide Leadership, Engagement, and Safety Survey discussed in criterion 2 above also helps demonstrate management engagement in SMP implementation at TREAT.

An example of management awareness of worker concerns occurred during performance of the ARCS response troubleshooting work package. TREAT Management was informed by a TREAT Control Technician of a personal family situation that had diverted his attention. Management quickly responded by correctly recognizing the potential fitness for duty implications and properly afforded relief from his assignment by allowing indirect interaction with his peers during the evolution, as the TCT felt comfortable. The technician was not assigned direct accountability and authority during the execution of the ARCS troubleshooting effort.

4. Management awareness of SMP related issues and shortcomings at the TREAT facility are in evidence at all levels of the organization. Managers are visible at the worksite monitoring work performance and providing feedback and reinforcement of expectations. In addition, appropriate forums are chartered and implemented at the TREAT facility, for senior management review and evaluation of activities affecting safe performance of work, including periodic review of the "health" of SMP implementation.

Management awareness and emphasis on SMP related issues were evident at all levels of the organization. Managers are present in the field on a daily basis and demonstrate responsibility and accountability for safe and effective work performance, including implementation of SMP activities. SMP issues and status are elements of all senior staff weekly meetings, and periodic reviews of Key Performance Indicators (KPIs). Leading and lagging indicators of SMP health are monitored by senior

management and revised as necessary to ensure emerging issues are recognized and addressed in a timely manner. The criterion was positively demonstrated during interviews with management, facility operators, support organizations, and administrative staff.

The review team conducted a group interview with TREAT senior managers and selected managers from external INL support organizations. During the interview TREAT managers were able to clearly describe how, as line management, they were responsible for the safe operation of TREAT, but they need the various support organizations to function together with TREAT staff to effectively implement SMPs. The support organization managers were also able to clearly articulate their roles and how they interfaced with TREAT.

During the group interview TREAT managers made a presentation to the review team on how the INL Contractor Assurance System (CAS) is implemented at the facility. The presentation was based on information and posters TREAT managers normally use to train facility staff on the CAS. The poster describing the CAS is also part of the INL Integrated Safety Management System (ISMS) Description confirming INL integrates the two functions in its management of laboratory missions.

The explanation of CAS implementation was concise and easy to understand. TREAT managers were able to describe how various features of the system interfaced and provide examples of information and lessons learned they have gleaned from the system. The management team was able to clearly describe how they used feedback from the CAS to evaluate and ensure TREAT SMPs were functioning properly and implementing specific functions of the site's ISM system.

TREAT managers explained in detail how three levels of CAS implementation are integrated to ensure SMPs are successfully implemented at TREAT and across INL. Each Assurance Level, or Tier, of the CAS integrates information gathered as input to performance metrics, from independent assessments, from self-assessments, and from worker feedback. This information is documented in a site-wide issues management system and used to analyze and trend performance from the facility to the site level.

Management review meetings are conducted periodically at each CAS implementation level to assess the various inputs to understand performance trends and drive learning and improvement. Site-wide, institutional performance is evaluated by the BEA Board of Managers while process owners and Executive/Operations Council(s) evaluate performance at a more detailed level.

Individual facilities or organizations present their Key Performance Indicators (KPI) to the INL Management Review Meeting on a quarterly basis. While TREAT KPIs have necessarily emphasized areas related to restarting reactor operations, managers understand that the KPIs will have to evolve to a set of performance measures appropriate for an operating facility.

Two important committees TREAT management depends on to ensure facility SMPs are functioning properly are the TREAT Operations Review Committee (TORC) and Safety Oversight Review Committee (SORC).

The TORC's role at TREAT is to ensure that: 1) ISM guiding principles are properly implemented, 2) the facility's safety basis is maintained, and 3) management decisions support cost-effective operation and mission support for TREAT. Management interviews and reviews of selected TORC meeting minutes confirmed the TREAT Plant Manager effectively uses the committee to inform important decisions and evaluate proposed safety basis changes.

The SORC's role is to provide independent oversight and review of TREAT safety basis documents to ensure attention to safety requirements. Interviews, reviews of SORC meeting minutes, and reviews of selected TREAT safety basis document changes confirmed the SORC is being effectively used to manage and protect the TREAT safety bases and supporting documents.

5. Prerequisites PR-1.1, PR-1.2, PR-1.3, PR-1.4, and PR-1.5 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

Based on interviews, the team's review of applicable internal memorandums, assessment results, SMP implementation documents, the team concluded that Prerequisites PR-1.1, 1.2, 1.3, 1.4, & 1.5 have been met and properly certified. The prerequisites ensure TREAT SMPs: comply with the INL requirement system; identify minimum staffing to implement SMPs; required facilities and equipment are sufficient to implement SMPs; SMP required assessments are performed; and SMPs are fully implemented.

With the exception of PR-1.3 (Documented TREAT assessments and evaluations conclude that adequate facilities and equipment are available to ensure that SMP support and services are adequate for safe conduct of TREAT) and PR-1.4 (Required SMP output documents are completed and documented), evidence packages originally provided to the review team supported completion of the prerequisites.

Additional interviews, and requests for additional assessment results and review committee minutes, were required for the team to conclude that PR-1.3 and 1.4 were complete. TREAT personnel will ensure that additional documentation will be included in the evidence packages prior to final readiness assessments.

CONCLUSION

This objective was met. There were no findings, deficiencies, or noteworthy practices identified.

TREAT line management has established and implemented SMPs to ensure safe accomplishment of work and implementation of the approved safety basis. The level of knowledge of managers and staff is adequate based on review of records, interviews, and observation of operational demonstrations. Senior Management presence is evident in the field, and their expectations for safety are clearly understood and evident in the workforce. Processes are in place to periodically assess the effectiveness of SMPs and make corrections if necessary.

FINDINGS

None

NOTEWORTHY PRACTICES

None

Assessed by:	Sam Glenn **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Management

Functional Area:	Objective: MG2	OBJECTIVE MET	
Management	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

MG2: Functions, assignments, responsibilities, and reporting relationships (including those between the line operating organization and ESH&QA support organizations) are clearly defined, understood, and effectively implemented with line management responsibility for control of safety.

CRITERIA

1. Clear, unambiguous and appropriate roles, responsibilities, authorities and accountabilities (R2A2s) and lines of authority for safe and effective work performance – including administration and implementation of SMPs – at all levels of management and within the workforce are established, understood, maintained, and demonstrated at the TREAT facility with TREAT facility operations line management responsible and accountable for safety.
2. TREAT processes and procedures adequately implement TREAT Operations Manager responsibilities (AC 5.2.1), TREAT Shift Supervisor responsibilities (AC 5.2.2).
3. Line managers at all levels demonstrate responsibility and accountability for safe and effective work performance at the TREAT facility, including administration and implementation of SMP activities.
4. Organizational charts and documentation (e.g., procedures and other appropriate mechanisms) are in place that: 1) clearly define roles, responsibilities, authorities, and accountabilities; 2) clearly establish line management's responsibility, and 3) ensure safety is maintained at all levels. TREAT Organization charts meeting the requirements of AC 5.3.1 are available.
5. Prerequisites PR-2.1, PR-2.2, and PR-2.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review selected procedures, position descriptions, and organizational charts for appropriate definition of roles and responsibilities; line management responsibility for safety; and management of interfaces related to control of safety. Review procedures for clarity of assigned roles/responsibilities. Review some subcontracts, if applicable, for clarity of assigned safety responsibilities and appropriate oversight.

Interview selected personnel (who manage, oversee, supervise, support, or conduct TREAT facility operations) including senior and middle management, operators, maintenance personnel, SMP and functional area staff to assess their understanding of roles and responsibilities related to safety of themselves and their supervision. Ascertain their understanding of line management's responsibility for safety and its effectiveness.

Observe planning meetings, briefings and work performance during routine evolutions, field performance demonstrations, tabletop exercises, and operational and emergency drills to ascertain that clear roles and responsibilities for safety are discussed and implemented in the field during work evolutions.

Reviewer: All with Sam Glenn lead

Records Reviewed

- ASTM 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity", 05/08/2017
- 10 CFR 851, "Worker Safety and Health Program"
  PDD-1004, R17, "Integrated Safety Management System", 05/20/2016
- LRD-14700, R3, "Worker Safety and Health: General Program Requirements"
- LWP-14002, R5, "Timeout and Stop Work Authority"
- LWP-6200, R13, "Maintenance Integrated Work Control Process"
- TS-420, R1, "Technical Specifications for the TREAT Facility"
- SAR-420, R1, "Transient Reactor Test (TREAT) Facility FSAR"
- GDE-9201, R0, "Conduct of Operations Guidance for Laboratory Guidance"
- MCP-3955, R2, "Conduct of Operations for the TREAT Facility"
- SP-50.05, R5, "Resumption of Transient Testing Program Roles and Responsibilities", 5/02/2017
- SD-49.4.4, R3, "TREAT Operations Roles and Responsibilities", 04/13/2017
- SD-49.5.0, R3, "TREAT Experiment Safety Engineering Roles and Responsibilities", 03/23/2017
- SD-49.4.5, R2, "TREAT Facility Engineering Roles and Responsibilities", 10/11/2016
- SD-49.6.0, R3, "TREAT Maintenance Roles and Responsibilities", 03/29/2017
- PDD-171, R2, "Contractor Assurance System"
- CTR-396, R5, "TREAT Facility Safety Operations Review Committee", 04/17/2017
- CTR-399, R4, "TREAT Operations Review Committee", 03/30/2017
- PLN-5223, R2, "TREAT Restart Plan"
- LRD-14005, R2, "Activity Level Hazard Identification, Analysis, and Control"
- 442.24, R4, "Fall Hazard Prevention Analysis"
- LabWays by employees (1st Quarter 2017)
- Lightning Fast response times – poster and spreadsheet
- TREAT Paired Observations, 6/16/16 thru 2/17/17
- Management Observations, 1/1/17 thru 3/31/17
- All Hands Meetings presentation 10/17/16
- TREAT Operations Organizational Chart, 4/26/17
- TREAT Operational Staffing Plan, Memorandum Broussard to Bumgardner, 5/23/17
- PLN-5146, "Contractor RA Plan of Action for the TREAT Restart of Transient Testing Activity", Memorandum Kinghorn to Broussard, 5/23/17

- ASMT 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness For the TREAT Restart of Transient Testing Activity"

Interviews Conducted

- TREAT Director, Resumption of Transient Testing Program
- TREAT Plant Manager
- TREAT Oversight and Assurance Division Director
- TREAT Quality Assurance Manager
- TREAT Radiological Controls Manager
- TREAT Occupational Safety and Health Manager
- TREAT Emergency Planning Manager
- MFC Radiological Controls Manager
- Duty MFC Emergency Action Manager
- Operations Manager
- Industrial Hygiene
- TREAT Operators (2)
- Environmental Support and Services
- Training Manager
- Maintenance Mechanic
- Industrial Safety
- Radiological Control Technician

Evolutions/Operations Witnessed

- Prejob brief and demonstration for Dedicated Microprocessor Tester Operations, TREAT-OI-0509
- Prejob brief and demonstration for TREAT-OI-0507, Transient Operations
- Prejob brief and demonstration of TREAT-OI-0304, Fuel Handling Cask Operations
- Field work for Work Order 245986-01, East Roll-up Door Repair
- Building 721 walkthrough
- Building 720 walkthrough
- Building 724 walkthrough
- Weekly Issues Management Meeting
- Daily Maintenance Toolbox and Safety Meeting
- Emergency Drill

DISCUSSION OF RESULTS

1. *Clear, unambiguous and appropriate roles, responsibilities, authorities and accountabilities (R2A2s) and lines of authority for safe and effective work performance – including administration and implementation of SMPs – at all levels of management and within the workforce are established, understood, maintained, and demonstrated at the TREAT facility with TREAT facility operations line management responsible and accountable for safety.*

Based on reviews of TREAT related R2A2s, interviews of management and staff personnel, and observation of work demonstrations and operations, the review team concluded lines of authority and R2A2s are clearly established and understood at the facility with line management responsible and accountable for safety.

The review team assessed implementation of applicable R2A2s by observing facility work demonstrations including pre and post job briefings, informed by individual and group interviews of managers and operators. In all cases, operators and technicians were able to clearly articulate their responsibilities to perform work safely and in accordance with approved work control documents. Without exception workers understood their responsibility to pause or stop work if they or other personnel were not confident a work step or evolution could be completed safely.

Group interviews demonstrated that all levels of TREAT management, and support organizations, understood TREAT management's line responsibility for ensuring work was conducted safely. TREAT personnel also demonstrated a clear understanding of their responsibility to implement and maintain SMPs at the facility.

2. TREAT processes and procedures adequately implement TREAT Operations Manager responsibilities (AC 5.2.1), TREAT Shift Supervisor responsibilities (AC 5.2.2).

Based on review of TREAT Standing Directive SD-49.4.4, steps 4.3.2 and 4.5.1, interviews of TREAT management and operators, and observation of simulated reactor operations, the review team concluded this criterion has been met.

SD-49.4.4 restates the specific responsibilities of the TREAT Operations Manager and TREAT Shift Supervisor enumerated in the subject Administrative Controls. During interviews and observation of simulated reactor operations, personnel in both positions correctly identified their responsibilities with respect to the Standing Directive and Administrative Controls.

3. Line managers at all levels demonstrate responsibility and accountability for safe and effective work performance at the TREAT facility, including administration and implementation of SMP activities.

Based on observations and interviews, the review team concluded TREAT's line management is responsible and accountable for safe and effective work at the facility, including personnel, facility, and environmental safety.

Management awareness and emphasis on SMP administration and implementation are evident at all levels of the organization. Managers are present in the field on a daily basis and demonstrate responsibility and accountability for safe and effective work performance, including implementation of SMP activities. SMP issues and status are elements of all senior staff weekly meetings, and periodic reviews of Key Performance Indicators (KPIs). Leading and lagging indicators of SMP health are monitored by senior management and revised as necessary to ensure emerging issues are recognized and addressed in a timely manner. The criterion was positively demonstrated during interviews with management, facility operators, support organizations, and administrative staff.

The review team conducted a group interview with TREAT senior managers and selected managers from external INL support organizations. During the interview TREAT managers were able to clearly describe how, as line management, they were responsible for the safe operation of TREAT, but they need the various support organizations to function together with TREAT staff to effectively implement SMPs. The support organization managers were also able to clearly articulate their roles and how they interfaced with TREAT.

4. Organizational charts and documentation (e.g., procedures and other appropriate mechanisms) are in place that: 1) clearly define roles, responsibilities, authorities, and accountabilities; 2) clearly establish line management's responsibility, and 3) ensure safety is maintained at all levels. TREAT Organization charts meeting the requirements of AC 5.3.1 are available.

The review team concluded, based on observations, interviews, and reviews of TREAT organizational charts, applicable R2A2s, lab-wide and facility administrative procedures, and selected work control documents, that this criterion was met.

As discussed in other criterion under this Objective, TREAT management, staff, and supporting organizations clearly understand the R2A2s as implemented at TREAT and their individual responsibilities to safely perform work.

TREAT organizational charts showing the functions required by Administrative Control (AC) 5.3.1 of TS-420 (R.1) have been approved and are available for use by the facility and supporting organizations. The charts show that the TREAT Director-Resumption of Transient Testing Program, TREAT Plant Manager, and TREAT Oversight and Assurance Division Director represent the line management responsible for the safe operation of TREAT.

5. Prerequisites PR-2.1, PR-2.2, and PR-2.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

Based on interviews, the team's review of applicable internal memorandums, INL assessment results (including the MSA), and SMP implementation documents, the team concluded that Prerequisites PR-2.1, 2.2, & 2.3 have been met and properly certified.

The prerequisites ensure TREAT SMPs: (2.1) document functions, assignments, responsibilities, and reporting relationships within TREAT and between TREAT and environment, safety, and health support organizations; (2.2) define responsibilities for the TREAT Operations Manager and TREAT Shift Supervisor that adequately implement AC 5.2.1 and AC 5.2.2; and (2.3) ensure organizational charts which meet AC 5.3.1 requirements have been prepared, approved, and are available.

The TREAT MSA team originally identified some weaknesses in the evidence packages. Additional information provided to the MSA team allowed the MSA reviewers to conclude the prerequisites had been met. The Contractor Readiness Assessment team also concluded, based on the expanded evidence packages, that the prerequisites have been met.

CONCLUSION

This objective was met. There were no findings, deficiencies, or noteworthy practices identified.

Based on reviews of applicable programmatic and TREAT implementing procedures, interviews of TREAT line managers and staff, and observation of selected operations, and management meetings, the review team concluded this Objective has been met. TREAT R2A2s (including those between the line operating organization and ESH&QA support organizations) are clearly defined, understood, and effectively implemented with line management responsibility for control of safety.

FINDINGS

None

NOTEWORTHY PRACTICES

None

Assessed by:	Sam Glenn **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Management

Functional Area:	Objective: MG3	OBJECTIVE MET	
Management	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

MG3: An adequate startup or restart program has been developed that includes plans for graded operations and testing after startup or resumption to simultaneously confirm operability of equipment, the viability of procedures, and the performance and knowledge of the operators. The plans should indicate validation processes for equipment, procedures, and operators after startup or resumption of operations, including any required restrictions and additional oversight. Any compensatory measures required during the approach to full operations are described.

CRITERIA

1. A startup plan has been developed and approved; implements the guidance of DOE-STD-3006-2010 (including confirming equipment operability, procedure viability, and personnel performance and knowledge); and is adequate to control initial reactor operations following receipt of authorization to restart those operations from the Startup Authority.
2. The startup plan describes validation processes for equipment, procedures, and operators after resumption of operations, including any required restrictions and additional oversight.
3. For any compensatory measures, restrictions, and additional oversight required by the startup plan during the approach to full unrestricted operation; the conditions that must be satisfied in order to remove them are also identified.
4. Prerequisite PR-11.1has been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

The Startup Plan and other key referenced procedures and supporting documentation will be reviewed to ensure compliance with the above objective and criteria, namely to ensure that the startup plan has been developed and approved, implements the guidance in Appendix 2 of DOE-STD-3006-2010, is adequate to control initial reactor operations, includes additional controls, support, and oversight for an initial period of deliberate operation following restart authorization, is designed to remain in effect through designated evolutions and operator certifications until the reactor is released for unrestricted operation, and describes any compensatory measures required during the approach to full operation.

The Startup plan will also be reviewed to also confirm that it indicates validation processes for equipment, procedures, and operators after restart, including any required restrictions and additional oversight.

Additionally, the results of the MSA relative to the restart process will be reviewed to evaluate any restart related items on the manageable list of open items, if any, and determine adequacy of plans for resolution.

Interviews of selected management and staff will be conducted to ensure that roles and responsibilities are properly understood relative to the execution of the startup plan.

Observe the conduct of oversight described in the Restart Plan (if in place) during the CRA, including documentation, feedback, and reporting mechanisms.

Reviewer: Sam Glenn

Records Reviewed

- PLN-5223, R2, "Treat Restart Plan", 05/23/2017
- ASTM 2017-0628, R0, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity", 05/08/2017
- MCP-9902, R3, "Verification of Readiness to Start Up or Restart Nuclear Facilities", 09/23/2015
- INL PLN-5146, "Contractor Readiness Assessment Plan Of Action for the Treat Restart of Transient Testing Activity"
- DOE-STD-3006-2010, "Planning and Conducting Readiness Reviews
- LWP-9903, R4, "Performing Management Self-Assessments for Readiness", 08/14/2013
- SP-50.1.3, R2, "TREAT Senior Supervisor Watch Program Supplement to LWP-9500", 04/03/2017
- LWP-13840, R8, "Issues Management", 09/30/2015
- PDD-171, R2, "Contractor Assurance System", 08/21/2014
- OS-OPAD-NSP-16-026, Robert Boston to John Bumgardner, Subject: Contract No. DE- AC07-05ID14517 - Department of Energy Approval of Transient Reactor Test Facility Safety Analysis Report (SAR-420) and Technical Specifications (TS-420), 07/20/2016
- Memorandum, J.R. Biggs to D.J. Broussard, Subject: "PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity", 05/25/2017

Interviews Conducted

- TREAT Director, Resumption of Transient Testing Program
- TREAT Plant Manager
- TREAT Operations Manager

Evolutions/Operations Witnessed

- Reactor startup and transient evolution, demonstration
- Reactor steady state operation and abnormal occurrences, demonstration
- Fuel handling cask operations, demonstration
- Emergency drill

DISCUSSION OF RESULTS

1. A startup plan has been developed and approved; implements the guidance of DOE-STD-3006-2010 (including confirming equipment operability, procedure viability, and personnel performance and knowledge); and is adequate to control initial reactor operations following receipt of authorization to restart those operations from the Startup Authority.

TREAT management has developed and approved the TREAT Restart Plan based on the guidance of DOE-STD-3006-2010. The plan provides sufficient criteria for management or Senior Supervisory Watch

(SSW) observers to determine equipment operability, procedure viability, and operator proficiency. In some cases the plan directs evaluators to use applicable TREAT operating instructions as the basis for those determinations.

Based on a review of TREAT qualification records, the review team concluded that a sufficient number of TREAT management and technical personnel were qualified as Senior Supervisory Watch to support restart activities identified in the TREAT Restart Plan. Review of qualification records and approved TREAT organization charts also showed that sufficient personnel are available to meet TREAT Reactor Engineer and Nuclear Facility Manager oversight requirements for restart activities.

Two areas were identified where the TREAT Restart Plan, as approved, does not fully meet the guidance of DOE-STD-3006-2010. The plan does not address the removal of poison assemblies currently installed in the reactor, nor does it require demonstration of management or SSW observations during readiness reviews.

In its July 2016 Safety Evaluation Report (SER), documenting review and approval of the TREAT SAR and TS, DOE included a condition of approval requiring poison assemblies installed in the reactor to remain until "…successful completion of the DOE Readiness Assessment for TREAT and the Start-up Authority providing written approval to start TREAT operations." The TREAT Restart Plan (R.2) does not address the timing or approval(s) needed to remove installed poison assemblies from the reactor, nor does it provide direction for management/SSW oversight of associated work evolutions. (**MG3-PRE-1)**

DOE-STD 3006, Appendix 2 states, "In all cases, it is appropriate that the controls specified in the Startup Plan be demonstrated during the RR (Readiness Review). The required compensatory oversight and recordkeeping should also be demonstrated. In short, all elements of the Startup Plan should be evaluated in the facility during the RR."

The TREAT Restart Plan does not include guidance or requirements for the demonstration of management/SSW oversight in conjunction with contractor or DOE readiness reviews (assessments). Per the current plan, it does not become effective until the Start-up Authority approves the start of TREAT operations. (MG3-DEF-1)

The review team concluded that, after revision of the TREAT Restart Plan to address sequencing and oversight of removal of poison assemblies, the plan will be adequate to control initial reactor operations following receipt of authorization to restart those operations from the Startup Authority.

2. The startup plan describes validation processes for equipment, procedures, and operators after resumption of operations, including any required restrictions and additional oversight.

The startup plan describes what additional oversight will be established to evaluate facility performance during defined reactor restart activities and the qualifications for personnel assigned to perform the oversight. The plan provides criteria (in the plan or by reference) for assessing the facility's performance and evaluating whether activities were performed satisfactorily and met requirements.

3. For any compensatory measures, restrictions, and additional oversight required by the startup plan during the approach to full unrestricted operation; the conditions that must be satisfied in order to remove them are also identified.

The startup plan, specifically Sections 5.0 and 6.0 in conjunction with the instructions of Appendix B, describe the compensatory measures, restrictions, and oversight required as the plant completes restart activities. The plan also delineates the conditions that must be satisfied in order to terminate the operating restrictions imposed by the Restart Plan. The plan specifies the number of successful evolutions that must be observed for each work activity identified as part of TREAT restart.

4. Prerequisite PR-11.1has been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

Based on interviews, the team's review of applicable internal memorandums, and the approved TREAT Restart Plan, the team concluded that Prerequisite PR-11.1 has been met and properly certified.

CONCLUSION

The objective was met. One Pre-Start Finding and one Deficiency were identified. No Noteworthy Practices were identified. A restart program has been developed that includes plans for graded operations to simultaneously confirm operability of equipment, the viability of procedures, and the performance and knowledge of the operators. The plan includes criteria for senior personnel to use while performing oversight. Criteria for discontinuing additional oversight are also included.

FINDINGS

Pre-Start

MG3-PRE-1: Contrary to INL PLN-5146, "Contractor Readiness Assessment Plan Of Action for the Treat Restart of Transient Testing Activity" the TREAT Restart Plan does not address the timing or approval(s) needed to remove installed poison assemblies from the reactor, nor does it provide direction for management/SSW oversight of associated work evolutions.

Post-Start

None

DEFICIENCIES

MG3-DEF-1: The TREAT Restart Plan does not include guidance or requirements for the demonstration of management/SSW oversight in conjunction with contractor or DOE readiness reviews (assessments).

NOTEWORTHY PRACTICES

None

Assessed by:	Sam Glenn **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Management

Functional Area: **Management**	Objective: MG4 Date: 06/16/2017	OBJECTIVE MET	
		YES ☒	NO ☐

OBJECTIVE:

MG4: Formal agreements between the operating contractor and DOE have been established via the contract or other enforceable mechanism to govern safe facility operations. A systematic review of the facility's conformance to these requirements has been performed. These requirements have been implemented in the facility, or compensatory measures are in place during the period of implementation. The compensatory measures and the implementation period are approved by DOE.

CRITERIA

1. In recognition that laboratory requirements documents and implementing procedures are a mature system incorporating Contract List A and B requirements that has proven to be satisfactory for INL Nuclear Facilities (as stated in the DOE approved POA); the INL requirements system is not a focus of this CRA. The CRA will verify that TREAT procedures are prepared, reviewed, and approved within the framework of the INL requirements system.
2. The following documents are approved and in place: a DOE approved SAR and TS, a DOE SER including any Conditions of Approval, and a safety basis implementation matrix.
3. Fire Exemptions and Equivalencies pursuant to DOE Order 420.1C have been approved by DOE and required compensatory actions have been implemented.
4. Prerequisite PR-13.1 has been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review TREAT procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review key documents to assess the status of formal agreements that govern safe facility operations. These key documents will include Nuclear Operations Authorization Agreement, approved SAR and TS, and the DOE SER, including any conditions of approval. Other documentation, including identified compliance schedule approvals, exemptions, and compensatory measures associated with the nuclear safety requirements, if any, will be reviewed. Any compensatory measures that may have been identified will be evaluated to ensure the measures and the implementation periods are approved by BEA and DOE.

Review Fire Exemptions and Equivalencies to ascertain approval by DOE. Associated compensatory measures will be reviewed to assure they have been implemented

Interview selected management and staff to ensure they are aware of any non-compliances and actions necessary to fully implement nuclear safety, fire protection, and permit requirements, as well as any interim compensatory measures or items captured in the facility commitment tracking system.

As appropriate, observe activities that demonstrate implementation and effectiveness of any identified compensatory measures.

Reviewer: Anne McCartin

Records Reviewed

- ECR 648480 to TREAT-OI-0504
- ECR 648894 to TREAT-OI-0708
- ECR 650329 to TREAT-OI-0704
- ECR 650333 to TREAT-OI-0507
- ECR 650253 to TREAT-OI-0705
- Letter, CCN 234398, from C. Mascareñas to R. Provencher, Subject: "Increase of Occupant Load in MFC-720 Basement Equivalency Request," December 9, 2014.
- Letter, CCN 236912, from C. Mascareñas to R. Provencher, Subject: "Lack of Fire Suppression in Building MFC-720 High Bays Exemption Request," October 30, 2015.
- Letter, CCN 237147, from C. Mascareñas to R. Provencher, Subject: Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches," December 8, 2015.
- Letter, EM-NSP-14-061, from to T. Dieter and J. Grossenbacher, Subject: "Authority Having Jurisdiction Approval for the Revised Fire Protection Equivalency for the Inspection, Testing, and Maintenance Frequencies (EM-NSP-14-061)," November 17, 2014.
- Letter, ICP CCN 316863 and INL CCN 233950, from K. Daniels and C. Mascareñas to R. Provencher, Subject: "Fire Protection Equivalency for the Inspection", Testing, and Maintenance Extended Frequencies (DOE-ID-FPEQ-03-06 Rev. 3)," September 15, 2014.
- Letter, IFM-15-003, from R. Provencher to J. Grossenbacher, Subject: "Authority Having Jurisdiction Approval for Equivalency Request to Increase of Occupant Load in MFC-720 Subpile Room and Basement Auxiliary Room," February 3, 2015.
- Letter, IFM-16-002, from R. Provencher to M. Peters, Subject: "Authority Having Jurisdiction Approval for Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches Equivalency Request," January 20, 2016.
- Letter, IFM-16-007, from R. Provencher to M. Peters, Subject: "Authority Having Jurisdiction Approval for Lack of Fire Suppression in Building MFC-720 High Bays Exemption Request," February 29, 2016.
- Letter, OS-OPAD-NSP-12-021, from R. Furstenau to R. Chase, Subject: "Cancellation of Authorization Agreements for Idaho National Laboratory Facilities," April 19, 2012.
- Letter, OS-OPAD-NSP-16-026, from R. Boston to J. Bumgardner, Subject: "Department of Energy Approval of the Transient Reactor Test Facility Safety Analysis Report (SAR-420) and Technical Specifications (TS-420)," July 20, 2016, including SER enclosure.
- Letter, OS-OPAD-NSP-17-008, R. Boston letter to J. Bumgardner, Subject: "Department of Energy Approval of the Transient Reactor Test Facility Final Safety Analysis Report (SAR-420) Revision 1 and Technical Specifications (TS-420) Revision 1," February 16, 2017, including SER enclosure.
- LST-992, Rev. 3, "TREAT Nuclear Safety Basis Implementation Matrix," April 13, 2017.

- LWP-1201, Rev. 11, "Document Management", October 16, 2014.
- LWP-1202, Rev. 9, "Records Management," July, 28, 2014.
- LWP-9101, Rev. 0, "INL Procedure Usage," March 16, 2010.
- LWP-21220, Rev. 13, "Work Management," March 16, 2016.
- MCP-9395, Rev. 4, "Releasing and Distributing, DMCS Controlled Documents," February 12, 2016.
- Memorandum, from J. Biggs to D. Broussard, Subject: "PLN-5146, Contractor Readiness Assessment (RA) Plan of Action for the TREAT Restart of Transient Testing Activity," May 25, 2017.
- SAR-420, Rev. 1, "Transient Reactor Test (TREAT) Facility FSAR," March 1, 2017.
- SP-50.0.2, Rev. 6, "TREAT Document Management Supplement to LWP-1201 and LWP-21220," April 13, 2017.
- TS-420, Rev. 1, "Technical Specifications for the TREAT Facility," March 1, 2017.

Interviews Conducted

- TREAT Safety Analyst
- TREAT Implementation Coordinator

Evolutions/Operations Witnessed

None

DISCUSSION OF RESULTS

1. *TREAT procedures are prepared, reviewed, and approved within the framework of the INL requirements system.*

TREAT procedures were reviewed as part of each functional area. The issues identified during the reviews were consolidated and categorized for evaluation as part of the Procedure Management functional area (PM1). Additional review was conducted as part of PM1 to determine if the issues identified were individual issues or if they were indicative of a systemic problem. The categorization groupings included inadequate flow down from company standards and inadequate implementation of regulatory standards. The CRA team concluded that there was no systemic concern that linked the procedure issues within the identified categories and that each procedure issue stood on its own individual merit. Therefore, it was concluded that TREAT procedures are prepared, reviewed, and approved within the framework of the INL requirements system.

2. *The following documents are approved and in place: a DOE approved SAR and TS, a DOE SER including any Conditions of Approval, and a safety basis implementation matrix.*

The following documents are approved and in place:

- SAR-420, Rev. 1, "Transient Reactor Test (TREAT) Facility FSAR, March 1, 2017.
- TS-420, Rev. 1, "Technical Specifications for the TREAT Facility," March 1, 2017.
- LST-992, Rev. 3, "TREAT Nuclear Safety Basis Implementation Matrix," April 13, 2017

Revision 0 of SAR-420 and TS-420 were approved by DOE on July 20, 2016 (OS-OPAD-NSP-16-026) and Revision 1 (OS-OPAD-NSP-17-008) was approved on February 16, 2017. The approval letters, and the attached SERs, demonstrate that approved facility safety documentation is available.

The SER for revision 0 of the SAR and TS identified the following 4 COAs:

1. The minimum shutdown margin specified by LCO 3.2.3 shall be maintained by the 16 poison assemblies installed in the core to allow mock operations for equipment testing, operator training, procedure validation, and restart activities. This COA is cancelled following successful completion of the DOE Readiness Assessment for TREAT and the Start-up Authority providing written approval to start TREAT operations.
2. Remove the following paragraph from TS Section 2, Safety Limits,: "Based on the accident analysis results from SAR-420 Chapter 15, per ANSI/ANS 15.1, 2.1.3(1), no TREAT SLs are derived for protection of the offsite public. However, to align TREAT with industry precedent for other test/research reactors operated by the DOE, per ANSI/ANS 15.1, 2.1.3(2), the following SL is established:"
3. Remove the following paragraph from TS Section 3/4, Operating Limits and Surveillance Requirements: "Based on the accident analysis results from SAR-420 Chapter 15, per this criterion, no LCSs are required. However, to align TREAT with industry precedent for other test/research reactors operated by the DOE, per ANSI/ANS 15.1, 2.2, an LCS was established."
4. Revise TS AC 5.8.3 to read:

   AC 5.8.3 A CONTRACTOR-designated independent review committee shall review, as a minimum, the following:

   a. Potential inadequacy in the safety analysis (PISA) USQ determinations.
   b. Potential inadequacy in the safety analysis (PISA) reasonability determinations.
   c. Changes to the safety basis.
   d. Experiment safety analysis (ESA).
   e. Other items as requested by TREAT facility management.

   The membership, responsibilities, and procedures of the review committee shall be formally documented and approved by the contractor.

The SER for revision 1 of the SAR and TS stated that 3 of the 4 COAs (COAs 2, 3, and 4) have been implemented by the contractor and are superseded. COA 1 remains active, and one new COA was identified as follows:

1. Revise SAR-420, Chapter 10, Table 10-4, ESA, third bullet to read "A separate hazard analysis shall be required to support experiment support operations in the reactor building."

A review of TS-420 Revision 1 confirmed that COAs 2, 3, and 4 from the Revision 0 SER have been incorporated into the TS. A review of SAR-420 Revision 1 confirmed that the additional COA from the Revision 1 SER was incorporated into Revision 1 of the SAR upon publication/implementation.

LST-992 provides a matrix of SAR and TS requirements and their implementing documents and includes the COAs and their associated implementation.

The review did not include a review of an authorization agreement for TREAT because INL Hazard Category 1 and 2 nuclear facilities are not contractually required to have authorization agreements (OS-OPAD-NSP-12-021).

3. Fire Exemptions and Equivalencies pursuant to DOE Order 420.1C have been approved by DOE and required compensatory actions have been implemented.

There are three TREAT-specific fire protection equivalencies that have been requested and approved by DOE:

- Increase of Occupant Load in MFC-720 Basement (IFM-15-003 and CCN 234398)
- Lack of Fire Suppression in Building MFC-720 High Bays (IFM-16-007 and CCN 236912)
- Use of Non-Fire Rated Hydraulic Fluid in Transient Rod Drives and Compensation Rod Latches (IFM-16-002 and CCN 237147)

The implementation of the required compensatory measures and conditions of approval were evaluated as part of FP1 Criterion 5. The TREAT CRA Team concluded that the implementation of these actions was acceptable.

4. *Prerequisite PR-13.1 has been certified in writing by BEA as having been met and sufficient evidence is available to support the certification*

PR 13.1 reads as follows:

PR 13.1 TREAT processes and procedures have been prepared within the framework of the INL requirements system and reflect appropriate List A/List B requirements.

A review of the evidence files indicated that PR 13.1 was certified in writing by J. R. Biggs, TREAT Operations Manager/Nuclear Facility Manager, on May 25, 2017. The review concludes that sufficient evidence is available to support the certification.

CONCLUSION

The objective was met. There were no findings or noteworthy practices identified.

Formal agreements between BEA and DOE are established via the contract. A systematic review of the facility's conformance to the requirements described herein was performed. The review has determined that procedures have been prepared, reviewed, and approved within the framework of the INL requirements system, that a DOE approved SAR, TS, and SER (including COAs) and a safety basis implementation matrix are in place, and that fire exemptions and equivalencies have been approved and compensatory actions have been implemented.

FINDINGS

None

NOTEWORTHY PRACTICES

None

Assessed by:	Anne McCartin **CRA Team Members**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Contractor Assurance System Management

Functional Area:		OBJECTIVE MET	
Contractor Assurance System Management	Objective: MG5 Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

MG5: An effective feedback and improvement process (i.e., Contractor Assurance System) has been established to identify, evaluate, and resolve deficiencies and recommendations made by contractor line management and independent contractor audit and assessment groups. The process also provides for resolution of issues and recommendations by external official review teams and audit organizations. An effective Contractor Assurance System pursuant to DOE Order 226.1 is established.

CRITERIA

1. Open LabWay, NCR, ORPs and NTS issues do not impact the TREAT restart activities or have a satisfactory path forward.
2. Pre-Start Findings resulting from the Management Self-Assessment (MSA) have been appropriately closed. Corrective Action Plans (CAPs) have been established for Post-Start Findings resulting from the MSA. These do not negatively affect reactor operations based on collective significance review
3. A corrective action and lessons learned process is established and in place for TREAT facility operations activities as follows:
    a) Strong line management leadership of issues management program activities (problem identification, prioritization, analysis, and timely resolution) is evidenced through: (1) demonstrated ownership of and involvement with issues `management program activities commensurate with significance; (2) problem and corrective action backlogs are kept low enough to avoid impeding management's ability to determine and respond to issues of safety and mission significance in a timely manner; (3) problem resolution and backlog reduction efforts focus concurrently on timely and effective issue resolution; and (4) corrective action information is used to support organization and project trending and performance analysis activities.
    b) A means to identify work product deficiencies, human performance, and process concerns and issues that potentially impact safe and effective project execution or personnel safety is available to all staff and is used to identify such concerns and issues to management.
    c) Condition reports[c] are promptly evaluated for safety, mission impact, facility operability, and regulatory reportability concerns. Problems, lessons learned, and suggestions for improvement are prioritized, analyzed, and addressed commensurate with their importance. Managers are promptly made aware of significant project problems and follow up to ensure timely resolution. (Issue Screening)

[c] The term "condition report" is used in this document as a generic term to encompass terms such as problem report, issue form, performance improvement report, etc.

d) Issue Analysis is effectively delivered as evidenced by: (1) skilled, knowledgeable personnel perform causal analyses and event investigations and such analyses and investigations are completed in a timely manner; (2) significant problems are analyzed to identify technical, human performance, and organizational causes and contributors; the extent of condition and causes are evaluated during the analyses of significant and repetitive problems.

e) Corrective Actions are effectively managed and implemented as evidenced by: (1) corrective actions are timely, commensurate with the significance of the problems; (2) effectiveness reviews are conducted on corrective actions intended to prevent recurrence of significant problems; (3) responsibilities for implementing corrective actions are clearly assigned. Actions to address problems and other improvement initiatives are tracked through the project corrective action system or some other formal tracking system until completed.

4. Procedures and/or mechanisms are in place and utilized by personnel to collect feedback information such as workplace observations, self-assessment, monitoring against performance objectives, performance metrics, occurrence reporting, event investigation, routine observation, and other elements outlined in PDD-171.
5. TREAT has established TS-420 required audits and review functions.
6. Procedures are in place that develops feedback and improvement information opportunities at the TREAT facility.
7. Procedures and/or mechanisms are in place which includes a process for oversight that ensures regulatory compliance is maintained.
8. Prerequisites PR-14.1and PR-14.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review the Contractor Assurance System (CAS) description document and daughter procedures and documentation of DOE's approval of the CAS.

Review selected TREAT condition reports, screening documentation, causal analyses, corrective action plans, extent of condition review documentation, corrective action effectiveness review reports, corrective action backlog information, and other documents as deemed necessary.

Review the backlog of open TREAT Condition Reports and nonconformance reports for collective significance.

Review Pre-Start findings from the MSA and associated closure packages to assure they were satisfactorily closed. Also confirm that Post-Start Findings have been entered in the issues management process and CAPs have been developed. Review documentation of a collective significance review (if accomplished) of Post-Start DFindings from the MSA and/or review the Post-Start Findings for "apparent collective significance".

Review select self-assessment reports, performance monitoring data, occurrence reports, event investigation reports, and management observation reports to confirm effective implementation of these CAS feedback collection activities.

Review select independent oversight reports associated with assurance of regulatory compliance to confirm effective implementation of this CAS activity.

Review procedures, charters, select minutes and other mechanisms associated with the specified forums for senior and middle management review and evaluation of activities affecting safe and secure performance of work to confirm establishment and effectiveness of these forums.

Review documented evidence demonstrating TS-420 required audits and review functions are satisfactorily fulfilled.

Interview the Contractor Assurance Manager and staff to ascertain how the attributes addressed in the criteria are carried out at the TREAT facility. Determine if the program broadly encourages the use of condition reports to identify performance improvement opportunities.

Interview the employee concerns manager to understand if there is an increasing trend in anonymous reports of safety problems (that otherwise would have resulted in a condition report).

Interview select TREAT line and support managers to determine how current organization/department performance improvement initiatives are coupled to condition reporting. Ascertain if managers are emphasizing condition reporting to ensure adequate information is available on the targeted improvement areas such that the problems can be better understood and monitored for improvement. Determine their expectations for use of the corrective action process within their organization and interview supervisors and staff to determine if similar understanding exists.

In line management, support management, and CAS management interviews: determine if multiple, lower-tier issue reporting and action tracking processes exist (in addition to the corrective action program). Where additional problem capture processes are identified, verify that their contents are periodically reviewed by appropriate management personnel and that problems warranting condition reports are not inadvertently masked. Additionally, determine if clear criteria exist within any low-level capture systems for what conditions must be reported using the corrective action process.

Observe select feedback collection, issues management, and corrective action activity meetings

Observe select senior and middle management evaluation and review forums/meetings.

Conduct a performance based review to determine how each of the attributes identified in criterion 3 were applied for approximately five selected significant issues including issues from: the MSA and DOE Assessments.

Reviewer: Sam Glenn and Alan Trost

Records Reviewed

- LWP-13840, R8, “Issues Management”, 09/30/2015
- PDD-171, R2, “Contractor Assurance System”, 08/21/2014
- PDD-1004, R2, “Integrated Safety Management System”, 05/20/2016
- ASTM 2017-0628, R0, “Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity”, 05/08/2017
- Memorandum, L.W. Kinghorn to D.J. Broussard, Subject: “PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity, Prerequisite 14.1”, 05/23/2017
- Memorandum, L.W. Kinghorn to D.J. Broussard, Subject: “PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity, Prerequisite”, 05/23/2017

- Memorandum, D.J. Broussard to J.D. Bumgardner, Subject: "Readiness to Proceed With Contractor Readiness Assessment for TREAT Restart of Transient Testing Activities", 06/01/2017
- LWP-13730 "Performance Assurance and Assessment"
- LWP-13840 "Issues Management"
- LWP-13735 "INL Management Observation Program"
- SAR-420 Chapter 13 "Human Factors"
- LWP-13850 "Processing Lessons Learned and Operating Experience"
- LWP-9903 "Performing Management Self-Assessment for Readiness"
- LWP-9500 "Laboratory Excellence Program Organization and Administration"
- SP-50.1.3 "TREAT Senior Supervisor Watch Program Supplement to LWP-9500"
- CTR-396, R5, "TREAT Facility Safety Operations Review Committee", 04/17/2017
- CTR-399, R4, "TREAT Operations Review Committee", 03/30/2017

Interviews Conducted

- TREAT Director, Resumption of Transient Testing Program
- Chief Operating Officer, Resumption of Transient Testing Program
- TREAT Plant Manager
- TREAT Operations Manager
- TREAT Oversight and Assurance Division Director
- TREAT Quality Assurance Manager
- TREAT OS&H Manager
- MFC Radiological Controls Manager
- TREAT Radiological Controls Manager
- MFC Emergency Action Manager
- TREAT Issues Coordinator

Evolutions/Operations Witnessed

- Plan of the Day meeting TREAT Facility 6/8/2017
- Weekly Treat Issues Management Meeting 6/8/2017
- Prejob brief and demonstration for Dedicated Microprocessor Tester Operations, TREAT-OI-0509
- Prejob brief and demonstration for TREAT-OI-0507, Transient Operations
- Prejob brief and demonstration of TREAT-OI-0304, Fuel Handling Cask Operations

DISCUSSION OF RESULTS

1. Open LabWay, NCR, ORPs and NTS issues do not impact the TREAT restart activities or have a satisfactory path forward.

The review team evaluated all TREAT-related LabWay, NCR, ORPS, and NTS open items. Each item was assessed to determine whether it was appropriately identified as having to be resolved pre or post-startup. CAPs were evaluated to determine if they were adequate to satisfactorily resolve a particulate issue or deficiency. Pre-Start findings from the TREAT MSA were also evaluated and the results are presented under Criterion 2 below.

No issues were identified and the team concurred that applicable issues are resolved or have satisfactory path forwards identified and approved CAPs in place.

2. Pre-Start Findings resulting from the Management Self-Assessment (MSA) have been appropriately closed. Corrective Action Plans (CAPs) have been established for Post-Start Findings resulting from the MSA. These do not negatively affect reactor operations based on collective significance review

Based on reviews of the objective evidence closure packages for MSA Pre-Start Findings, interviews, and observation of work governed by selected work documents, the team concluded the MSA Pre-Start findings were appropriately closed.

A weakness was noted in that TREAT personnel narrowly defined the family of documents evaluated for revision in response to both MSA Pre-Start Findings 7.3.3 and 9.1.1. Finding 7.3.3 was written against "Maintenance Model Work Orders" that did not identify all applicable "radiological hazards and subsequent mitigation steps". Finding 9.1.1 was written against "Multiple TREAT procedures" that did not meet applicable procedure content requirements (multiple actions per step, actions in Notes,…). In each case, while not required by applicable administrative procedures, the TREAT staff did not evaluate other areas or document types to determine the extent of condition. (MG5-D1)

A review was conducted of all Post-Start MSA findings, and applicable CAPs developed by TREAT. In all cases the CAPs were determined to be sufficient to correct the identified deficiency and ensure safe TREAT operations. All records reviewed indicated applicable INL company level and TREAT implementing procedures were followed.

The review team concluded that, collectively, the CAPs for MSA identified Post-Start findings are adequate and will not negatively affect reactor operations.

3. A corrective action and lessons learned process is established and in place for TREAT facility operations activities as follows:

a. Strong line management leadership of issues management program activities (problem identification, prioritization, analysis, and timely resolution) is evidenced through: (1) demonstrated ownership of and involvement with issues management program activities commensurate with significance; (2) problem and corrective action backlogs are kept low enough to avoid impeding management's ability to determine and respond to issues of safety and mission significance in a timely manner; (3) problem resolution and backlog reduction efforts focus concurrently on timely and effective issue resolution; and (4) corrective action information is used to support organization and project trending and performance analysis activities.

TREAT has assembled a qualified management and staff to ensure an appropriate focus on issues management. Senior management champions issue identification through frequent communications with the workforce. This attention also ensures the issues are addressed in a timely manner and that the backlog is maintained at a level that does not affect the mission.

The review team evaluated the TREAT issues management system (LabWay) to assess the types and age of all open issues. Less than 5% of open items were older than 365 days. Overall, issues are evaluated quickly, categorized, a CAP prepared, and actions assigned per the INL LabWay procedure.

The review team observed TREAT managers evaluate and categorize recently submitted issues. The team appropriately sorted the new issues and assigned actions to prepare CAPs per the INL procedure.

TREAT managers were able to describe how LabWay feeds the CAS and is used to evaluate and trend facility performance.

b. A means to identify work product deficiencies, human performance, and process concerns and issues that potentially impact safe and effective project execution or personnel safety is available to all staff and is used to identify such concerns and issues to management.

The INL Contractor Assurance System (CAS) encompasses activities designed to identify deficiencies and opportunities for improvement, report deficiencies to responsible managers and authorities, implement effective corrective actions, and share lessons learned. The assessment program, trending and analysis, and employee feedback mechanisms are the primary methods used at the TREAT facility to identify issues. TREAT Issues are reported and documented using the Issues Management System.

Nonconformance reporting at the TREAT facility is performed in accordance with the implementing requirements necessary to ensure that items that do not conform to specified requirements are identified, evaluated, dispositioned, and controlled to prevent inadvertent installation or use. Non-conforming conditions are be reported using the Issues Management System.

The INL Issues Management System (LabWay) used at TREAT consists of the basic elements of identification, reporting, evaluation, and correction of a broad range of workplace conditions. This single process is used to document failures, malfunctions, deficiencies, defective items, non-conformances, and conditions or actions that have a reasonable potential to cause adverse operational, environmental, safety and health, or quality assurance consequences.

Long-term Quality and Safety objectives are established and documented in Institutional Plans and Strategic Plans. Performance indicators and measures are selected to determine achievement of the established performance objectives. Each year, TREAT management establishes goals and evaluation criteria for each approved performance indicator and measure. Organizational responsibility is assigned for collecting and analyzing data for each indicator and measure. The necessary number and type of performance reports is then determined, and a formal list of these reports is established. Each performance report is reviewed to determine performance issues. Appropriate actions to address identified issues are initiated and tracked to completion.

The TREAT feedback and improvement process was evaluated through a combination of personnel interviews, document reviews, and observations, and found to be sufficiently implemented to support the TREAT Re-start activity. There are sufficient and compliant program documents, procedures, and processes in place, as determined by this review of the TREAT feedback and improvement process. There were no issues related to the TREAT effectiveness of the feedback and improvement process.

c. Condition reports[d] are promptly evaluated for safety, mission impact, facility operability, and regulatory reportability concerns. Problems, lessons learned, and suggestions for improvement are prioritized, analyzed, and addressed commensurate with their importance. Managers are promptly made aware of significant project problems and follow up to ensure timely resolution. (Issue Screening)

Appropriate pre-screening, categorization, and, when applicable, causal analysis and corrective actions are used to ensure the necessary level of rigor is applied for resolution. LabWay incorporates a graded-approach for the evaluation and resolution of all types of issues. The graded approach is defined, in part, by the risk and significance of the issue.

TREAT managers meet as often as needed, sometimes daily, to screen new issues for significance, assign trend codes, and assign a responsible person to manage the facility's response including preparation of a CAP. Representatives from operations, engineering, ESH, nuclear safety, QA, emergency and security management, as appropriate, participate in each screening. The committee also assigns the significance level to the issue. The LabWay electronic issue record is updated real time at the meeting to ensure information is not lost or improperly entered. Persons assigned actions are notified through electronic workflows, where progress is tracked by management. TREAT, senior management tracks LabWay issue closure as a performance indicator, to ensure that dates and commitments are met.

d. Issue Analysis is effectively delivered as evidenced by: (1) skilled, knowledgeable personnel perform causal analyses and event investigations and such analyses and investigations are completed in a timely manner; (2) significant problems are analyzed to identify technical, human performance, and organizational causes and contributors; the extent of condition and causes are evaluated during the analyses of significant and repetitive problems.

The review team concluded TREAT has sufficient skilled and knowledgeable personnel available to analyze issues identified through the facility's CAS and ISM systems. INL has personnel trained in causal analysis and event investigation. To ensure information related to significant incidents is captured in a timely manner, TREAT conducts fact finding reviews with all individuals involved in an event to capture critical information, including, the event chronology, causes, issues, and actions. These meetings are for data gathering purposes only, and are not intended to assign blame. The need for a root-cause analysis, apparent cause analysis, and lessons learned can result from this review.

e. Corrective Actions are effectively managed and implemented as evidenced by: (1) corrective actions are timely, commensurate with the significance of the problems; (2) effectiveness reviews are conducted on corrective actions intended to prevent recurrence of significant problems; (3) responsibilities for implementing corrective actions are clearly assigned. Actions to address problems and other improvement initiatives are tracked through the project corrective action system or some other formal tracking system until completed.

The review team concluded that TREAT is appropriately documenting issues and needed corrective actions in a timely manner. The multi-disciplined TREAT screening committee ensures corrective actions are assessed for significance and assigned to responsible managers. Progress is tracked electronically in LabWay, which provides insight to management on the progress of all issues. Management oversight and assessment performed within the CAS and ISMS ensure knowledgeable personnel review the progress of all actions and act proactively to ensure commitments are met.

4. Procedures and/or mechanisms are in place and utilized by personnel to collect feedback information such as workplace observations, self-assessment, monitoring against performance objectives, performance metrics, occurrence reporting, event investigation, routine observation, and other elements outlined in PDD-171.

The TREAT Program uses the INL Contractor Assurance System (CAS), in conjunction with the ISMS to ensure implementation of the TREAT Program at three levels: performance, leadership and management, and governance. These levels build upon and inform each other to ensure performance and risks are understood, managed and support TREAT mission accomplishment.

Based on interviews with the TREAT management team the 3 levels were described as follows:

At the Performance Assurance Level, managers and staff use a variety of assurance processes such as performance metrics, issues management, management observations, and lessons learned information to understand and report TREAT performance to drive individual and organizational learning and continuous improvement.

At the Leadership and Management Assurance Level, TREAT Leadership uses independent oversight to look for the successful integration of operations and the Issues management system with a focus on mission delivery to determine whether adjustments to process are necessary to improve overall risk management and system performance.

At the Governance Level TREAT management assurance strategy is executed through managers and TREAT committees that oversee the TREAT strategic direction, approve risk boundaries for the TREAT facility, and perform oversight to ensure that institutional risks are managed within approved boundaries.

In addition, the internal audits provide assurance regarding the adequacy and effectiveness of controls, risk, and governance processes. Compliance to this program was discussed with the TREAT management team. They supported the discussion with examples to demonstrate the effectiveness of the program in meeting management expectations and procedural requirements.

The TREAT Facility also uses a Senior Supervisor Watch (SSW) Program described in SP-50.1.3. This program implements the INL Laboratory Excellence Program using SSWs to reinforce management expectations and to ensure disciplined operations are achieved with a high performance level. The TREAT SSW program uses field observations to see firsthand what is happening in the facility. The quality of individual performance and supervision, the adherence to standards and expectations, the effectiveness of administrative processes, procedures, and training, as well as the material condition and the strength of the organization's values and safety culture require continual scrutiny. Field observations also provide personnel with the ability to gauge the effectiveness of performance-improvement efforts. This program helps align standards and expectations providing personnel the opportunity to interact and coach/mentor employees.

The TREAT feedback and improvement process was evaluated through a combination of personnel interviews, document reviews, and observations, and found to be sufficiently implemented to support the TREAT Re-start activity. There was evidence that TREAT Personnel are trained by management to the program requirements and expectations and do actively utilize the employee feedback program to support improvements in safety, quality and processes. There were no issues related to the TREAT effectiveness in utilizing the Contractor Assurance employee feedback and improvement process.

Based on reviews of program and implementing documents, extensive interviews of TREAT management and staff, and observation of demonstrations and normal facility routines, the review team concluded that TREAT's implementation of the INL CAS is excellent and a Note Worthy Practice (MG5-NWP1). The TREAT facility is operated and managed using the structure and processes that form the INL CAS and ISMS. Managers and staff are able to clearly explain their roles & responsibilities and how they contribute to the safe, effective operation of the facility.

5. TREAT has established TS-420 required audits and review functions.

The review team performed an evaluation of applicable company level assessment and audit procedures, and TREAT implementing instructions to confirm audit and review functions required by the approved TREAT Technical Specifications have been satisfactorily implemented.

Interviews of the TREAT issues coordinator, and management team, confirmed all were aware of the audit and review functions required by the approved TREAT Technical Specification and each was able to articulate the requirements as appropriate to their areas or responsibility.

6. Procedures are in place that develop feedback and improvement information opportunities at the TREAT facility.

Procedures are in place to ensure performance feedback is provided and opportunities for improvement are identified and investigated. Management observations, lessons learned, and the LabWay trend

analysis process, all provide avenues for feedback and improvements. INL/TREAT have also developed a comprehensive set of performance metrics to keep focus on trends and mission critical activities.

The issues management process is the feedback and improvement process that applies to all conditions identified by the TREAT organization and includes all services and activities interfacing with the TREAT facility that may impact operations, safety, health, quality, and the environment. The LabWay tool is used to support Issues Management and Work Management process. The process implements quality assurance requirements using a graded approach to condition resolution, and it incorporates related Contractor Assurance System processes, including event investigation, assurance activities, lessons learned, and regulatory reporting. This program includes identifying performance deficiencies and opportunities for performance improvement, reporting these to line management, and ultimately management ensuring the needed preventive and corrective actions are implemented in a timely and effective manner.

There was significant evidence that TREAT Personnel are trained to use the issues management process and do actively utilize it to implement the employee feedback program to support improvements in safety, quality and processes. There were no issues related to the TREAT effectiveness in utilizing the Contractor Assurance employee feedback and improvement process.

7. Procedures and/or mechanisms are in place which include a process for oversight that ensures regulatory compliance is maintained.

The review team concluded based on: reviews of company level programmatic documents and TREAT implementing procedures; interviews of TREAT staff; and reviews of the TREAT Assessment Index/assessment schedules/management review meeting minutes/and LabWay open and resolved items, that administrative mechanisms are in place to periodically ensure regulatory compliance is maintained at TREAT.

Reviews of applicable company level and TREAT procedures that implement the INL Contractor Assurance System (CAS) and Integrated Safety Management System (ISMS) confirmed these programs independently, and in concert, provide a robust mechanism to for INL management to ensure regulatory and contractual compliance is maintained with respect to TREAT operations.

Regular management review meetings, management observations, timely screening of LabWay issues, etc. provide management with contemporaneous feedback and information on facility performance. Scheduled facility and programmatic assessments, many independent of executing organizations, provide periodic evaluations of program performance.

The team concluded that at TREAT, programmatic and facility processes complement each other to ensure regulatory compliance is maintained.

8. Prerequisites PR-14.1and PR-14.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

Based on interviews, the team's review of applicable internal memorandums, assessment results (including the MSA), and SMP implementation documents, the team concluded that Prerequisites PR-14.1, & 14.2 have been met and properly certified.

The review team evaluated TREAT-related LabWay, NCR, ORPS, and NTS open items to confirm the MSA's evaluation of open items and CAPs. No issues were identified and the team concurred that applicable issues are resolved or have satisfactory path forwards identified.

A separate evaluation of applicable company level assessment and audit procedures, and TREAT implementing instructions confirmed audit and review functions required by the approved TREAT Technical Specifications have been satisfactorily implemented.

CONCLUSION

This objective was met. There were no findings or deficiencies identified. One noteworthy practice was identified.

An effective Contractor Assurance System has been established to identify, evaluate, and resolve deficiencies and recommendations made by contractor line management and independent contractor audit and assessment groups. Processes are in place at company and facility levels that provide for resolution of issues and recommendations by external review teams and audit organizations.

FINDINGS

None

NOTEWORTHY PRACTICES

MG5-NWP-1: TREAT's implementation of the INL CAS is excellent and a Note Worthy Practice. The TREAT facility is operated and managed using the structure and processes that form the INL CAS and ISMS. Managers and staff are able to clearly explain their roles & responsibilities and how they contribute to the safe, effective operation of the facility.

Assessed by:	Sam Glenn **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Maintenance

Functional Area:	Objective: MTI1	OBJECTIVE MET	
Maintenance	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

MTI1: Line management has established a Maintenance (including Testing and In-Service-Inspection (ISI)) SMP to ensure safe accomplishment of work. A program is in place to confirm and periodically reconfirm the condition and operability of Vital Safety Systems (VSS). This includes examinations of records of tests and calibration of these systems. Adequate facilities and equipment are available and adequate for safe facility operation and the material condition of all safety, process, and utility systems will support the safe conduct of work. The level of knowledge of Maintenance, Test, and ISI managers and staff is adequate.

CRITERIA

1. Maintenance, Testing, and ISI (MTI) requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.
2. TREAT facility structures and equipment are available and adequate for safe reactor operation and the material condition of safety, process, and utility systems is adequate to support the safe conduct of work.
3. Procedures for surveillance and calibration testing, in-service inspection, and safety assessment of safety related SSCs are effectively implemented in support of TREAT facility reactor operations.
    - VSS assessments and associated system health reports have been completed as scheduled and were adequate and effective.
    - ISIs have been performed and documented to confirm operability of the required VSSs and are current
    - Preventive Maintenance and calibration tests have been performed and documented to confirm operability of required VSSs and are current. A system is in place for managing preventive maintenance and calibrations.
    - Preoperational and functional tests are completed and current
    - A surveillance tracking system is in place and effective to ensure TS surveillance requirements are completed and confirm operability of associated SSCs within their required periodicity.
    - TS-420 surveillances are current/complete or are required as appropriate for operations.
4. Adequate procedures, facilities and equipment are available at the TREAT facility to ensure maintenance and test processes and procedures support of safe facility operation with adequate services.
5. Sufficient qualified personnel are available to effectively implement maintenance and test processes and procedures (including TS surveillance) in support of the facility. The level of knowledge of

managers and staff responsible for administering and implementing maintenance and test processes and procedures is adequate based on review of records, interviews, and observation of operational demonstrations.

6. Prerequisites PR-7.1, PR-7.2 and PR-7.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review maintenance program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with maintenance

On a smart sample basis, review the TS surveillance program to determine that safety requirements have corresponding surveillances. Review surveillance procedures to determine if acceptance criteria are established and met during the performances of periodic surveillances.

Review facility implementing procedures including completed surveillance procedures for safety related SSCs and verification records for the passive design features to verify they have been satisfactorily performed

Review the TS Surveillance tracking database to confirm that each surveillance test has been satisfactorily completed using the operational implementing procedure and is current within its required frequency interval.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the maintenance related role and responsibility interfaces with operations.

Review a representative sampling of documents and records that validate the implementation of MTI processes and procedures at the TREAT facility. These include:

- Management and independent assessment of MTI implementation and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the “health” of MTI implementation; including conclusions and assigned actions by senior management
- MSA documentation for MTI implementation,
- Status and documentation of all open and recently closed specific MTI related issues, corrective actions, and Lesson Learned.
- Staffing plan for MTI support.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing MTI work (including TS surveillance).
- MTI procedures and work packages (including those for TS surveillance) to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed and in-progress output documentation associated with MTI activities to confirm the adequacy and completeness of maintenance activities; including:

- In-progress or recently closed maintenance documents and/or work packages associated with safety related and mission critical SSCs to evaluate the adequacy and completeness of the maintenance activity
- listings of any open system deficiencies associated with safety related and mission essential SSCs to assess the condition of these systems to support safe and effective operation
- Master Equipment List (MEL) and associated Preventive Maintenance Justifications (PMJs) that show the determination of required maintenance for MEL SSCs
- Planned and completed preventive maintenance work orders for SSCs
- Planned and completed corrective maintenance work orders
- Planned and completed calibration work orders
- Calibration records
- Outstanding maintenance related issues as identified in the TREAT issues management system
- Identification of essential spares

Review a sampling of completed or in-progress test and calibration procedures for TS surveillances to determine the adequacy of procedures, fulfillment of acceptance criteria, disposition of test deficiencies, and closure of surveillance issues.

Review a select sample of VSS assessments, system health reports, ISI documentation and other supporting documentation for safety related systems and design features with to evaluate the readiness and operability of safety related systems and design features. This review should be interactive with responsible Cognizant System Engineers.

Interview selected personnel who are involved in performing, supervising, and reviewing maintenance activities to confirm their level of knowledge and understanding of maintenance related controls and requirements and their implementation and confirm their role and responsibility interfaces with the operations organization. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level SMP procedures. Ascertain if essential spare parts are identified and easily retrievable without significant interruption of operations. Ascertain if sufficient consumables are available, replenished, and maintained to support operations Personnel interviewed will include TREAT: planners; maintenance manager; maintenance supervisor(s), foremen, and workers; work document close out personnel.

Interview selected personnel associated with the TS surveillance program including selected cognizant system engineers, Shift Supervisors, Reactor Operators and I&C Technicians to assess their understanding of the surveillance testing requirements and basis.

Interview personnel such as the Facility Manager, Operations Manager, Control Room Operators, Plant Operators, and Cognizant System Engineers, to ascertain their understanding of safety and mission critical system and equipment vulnerabilities and review any associated documentation.

Observe maintenance related meetings (e.g., plan of the day/week meetings), pre job briefings, post job briefings, and field work to validate maintenance activities are being conducted safely and in a manner that will support and sustain operations. Observation of field work will include performance of maintenance and testing activities on safety class/significant SSCs to ascertain the adequacy of the scope of activities, accuracy of documented instructions, and the knowledge of the workers. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Walk down select safety related SSCs and observe select in progress surveillance tests, ISIs and calibrations of safety related SSCs and other calibration and MT&E program activities.

Perform facility system and equipment walk-downs, as accessible, with key operations and engineering personnel of selected safety and mission critical SSCs to evaluate the operability and material condition of safety, process and utility systems and design features to support safe facility operation.

Confirm by record review and walk down that calibration of select designated components, instruments, and gauges have been satisfactorily completed and are current within required frequency intervals. Confirm TS surveillance requirements are completed and confirm operability of associated SSCs within their required periodicity

Confirm TREAT MTI procedures and work documents (including those associated with TS surveillances) are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm operability and material condition adequacy of safety, process and utility systems and design features

Confirm availability of sufficient maintenance staffing and equipment to support operations.

Confirm that the knowledge of the maintenance workers and supervisors as well as workers and supervisors responsible for implementing TS surveillances is adequate and that workers are following the site's procedure compliance policy.

Reviewers: Rick Runnels and Tony Wilson

Records Reviewed

- Interoffice Memorandum, From Broussard to Bumgardner, Subject: TREAT Operational Staffing Plan, 05/23/2017
- Training Records (data run on 06/12/2017) for Maintenance personnel (Balance of Plant Mechanic, Electricians, Nuclear Mechanics, TREAT Control Technicians, Planners, and Laborers)
- Training 30/60/90 Report for TREAT Organization, 06/10/2017
- Memorandum, From Broussard to Bumgardner, Subject: Documentation for Internal Milestone Completion, Initiate Management Self-Assessment for Readiness to Resume Reactor Operations, 4/19/2017
- Letter, CCN240014, from Bumgardner to Newbry, Subject: Contract No. DE-AC07-05ID14517- Resumption of Transient Testing Program- Documentation – Completion of TREAT Implementation of SAR-420 Revision 1 and TS-420 Revision 1 for all modes of operation, 3/1/2017
- Interoffice Memorandum, From Neibert to Broussard, Subject: Contractor Readiness Assessment (RA) Plan of Action for the TREAT Restart of Transient Testing Activity, 05/30/2017
- LRD-6000, Rev. 1, "Maintenance Management Requirements"
- PDD-6000, Rev. 3, "INL Nuclear and Non-Nuclear Maintenance Management Program"
- LWP-6200, Rev. 13, "Maintenance Integrated Work Control Process"
- MCP-6201, Rev. 11, "Preventive/Predictive Maintenance Program"
- MCP-6303, Rev. 5, "Calibration of Facility Process and Control Instrumentation"

- SP-50.0.5, Rev. 5, "Resumption of Transient Testing Program Management Roles and Responsibilities"
- SP-50.3.2.1, Rev. 3, "TREAT Preventive/Predictive Maintenance Program – Supplement to MCP-6201"
- M-LI-113, Rev. 3, "Maintenance Work Performed at MFC"
- LI-623, Rev. 3, "Energized Electrical Work"
- ASMT 2017-0628, Rev. 0, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity"
- IAS 16905, *TREAT* "Maintenance Integrated work Control Process," 01/26/2016
- SP-50.3.2.4, Rev. 0, "Transient Test Reactor (TREAT) Facility Supplement to LI-623"
- TREAT OI-0509, Rev. 2, "Dedicated Microprocessor Tester Operations"
- FRM-1543, Rev. 3, "RTS Datasheet TS Related"
- FOR-298, Rev. 3, "TREAT Systems Functional and Operability Requirements"
- TREAT Master Equipment List (MEL)
- System Health Report - System ID #5, Compensation Rods
- System Health Report - System ID #6, Control/Shutdown Rods
- System Health Report - Two reports for System ID# 24, Manual Scram and Siesmic Trip
- Work Order Package 00245986 01, "Troubleshoot and Repair TREAT East Rollup Door #72"
- LST-900, Rev. 9, "TREAT Systems and Document Numbering Information"
- WO 247008, DRAFT, "TREAT 720 Compensation and C/S Rod Position Indication"
- MWO 229562-01, "3Y TREAT CS/CSR Air Receiver Tank Inspection PM"
- MWO 210842, "3Y TREAT 720 SCRAM Air Tank (NB-70848) Inspection"
- MWO 214314, "3Y TREAT 720 Plant Air Tank NB-139046 Inspection"
- MWO 219371-01, "Triannual TREAT 720-14-COMP-2202 Air /Receiver Tank Inspection PM (NB-391959)"
- MWO 219372, "3Y TREAT 720-14-COMP-2201 Air /Receiver Tank Inspection (NB-418274)"
- MWO 229870-01, *1Y TREAT-720 –* "Hydraulic System I&C Equipment Calibration (TS)"
- WO Q236561-01 (completed 03/10/2017), MWO 229870-01, "1Y TREAT-720 - Hydraulic System I&C Equipment Calibration (TS)"
- Q23819401 (completed 03/10/2017), MWO 229922-01, "RTS Transient Linear Channel Calibrations"
- WO 238192 & 238320 (Completed 10/31/2016), MWO 229923-01, "1Y TREAT-720 - RTS Transient Energy Channel Calibrations (TS)"
- WO 238193 & 245421 (Completed 10/31/2016), MWO 229924-01, "1Y TREAT-720 - RRTS Transient Log/Period Channel Calibrations (TS)"

- WO 238196 (Completed 10/28/2016), MWO 229925-01, “1Y TREAT-720 - RTS Steady-State Linear Channel Calibrations (TS)”
- WO 238198 (Completed 11/11/2016), MWO 229927-01, “1Y TREAT-720 - RTS Steady-State Log/Period Calibrations (TS)”
- WO 238199 (Completed 10/27/2016), MWO 229928-01, “1Y TREAT-720 - RTS Transient Input Trip Logic Calibrations (TS)”
- WO 238195 & 246640 (Completed 10/28/2016), MWO 229929-01, “1Y TREAT-720 - RTS Steady-State Input Trip Logic Calibrations (TS)”
- WO 238201 (Completed 10/28/2016), MWO 229931-01, “1Y TREAT-720 - RTS Output Trip Logic Calibration PM (TS)”
- WO 238197 (Completed 11/02/2016), MWO 229932-01, “1Y TREAT-720 - RTS Actuator Interface Calibration PM (TS)”
- WO 238200 & 240698 (Completed 11/16/2016), MWO 229933-01, “1Y TREAT-720 - RTS Pressure Switch Channel Calibrations (TS)”
- WO 238191 (Completed 10/26/2016), MWO 229934-01, “1Y TREAT-720 - RTS Seismic Channel Calibrations (TS)”
- WO 238190 & 244633 (Completed 12/08/2016), MWO 229935-01, “1Y TREAT-720 - RTS Fuel Temperature Channel Calibrations (TS)”
- WO 235613 & 241540 (Completed 11/01/2016), MWO 230085-01, “1Y TREAT-720 DMT ADC, DAC, Delay Timer Signal Calibration (TS)”
- WO 236172 & 237272 (Completed 09/09/2016), MWO 232434-01, “1Y TREAT-720 - DIS / MRCS / LCR / Period Calibrations (TS)”
- WO 244543 (Completed 03/09/2017), MWO 240577, “3M TREAT 720 Verify COMP & C/S Rod Drop Times (TS)”
- WO 247814, MWO 243344, (Completed 06/07/2017) “TREAT 720 TS&R ARCS (TS)”
- TREAT-OI-0502, Rev. 4, (not worked yet*)* “Automatic Reactor Control System Instructions”
- WO 244367 (Completed 04/07/2017), “TREAT 720 CABINET REPLACE FAN”
- WO 245992 (Completed 05/23/2017), “TREAT 720 TS&R TFHC HOIST (TS)”
- WO 244571 (Completed 05/22/2017), “TREAT 720 INSPECT THREADS OF CORE CLAMPING PUSHER (SR)”
- WO 243795 (not worked yet), “MWO 105981, 1M TREAT 720 130KW DIESEL GENERATOR”
- WO 243765 (not worked yet), “MWO 218316, 6M TREAT 720 AIR COMPRESSOR 720-14-CMP-2202 MAINTENANCE”
- WO 247601 (not worked yet), “MWO 107063, 3M TREAT 720 REACTOR BUILDING OXYGEN MONITOR CAL”
- WO 244892 (not worked yet), “TREAT 720 VERIFY NUCLEAR INSTRUMENT POSITIONS”

- WO 245220 (not worked yet), "TREAT 720 FABRICATE PROTOTYPE DMT/RTS SWITCH BOX"
- WO 247007 (Completed 06/12/2017), "MWO 245479, TREAT 720 INSPECT/REPAIR WEST OR SOUTH CORE CLAMPING MECHANISMS (SR)"
- WO 247016, "TREAT 720 TS&R Evacuation Notification System, 05/17/2017"

Interviews Conducted

- Maintenance Manager
- Maintenance Implementation Manager
- TREAT Control Technicians (2)
- Nuclear Maintenance Mechanics (3)
- Transient Control Specialists (3)
- TREAT Laborers (2)
- Balance of Plant Mechanic
- TREAT Shift Supervisor (2)
- Cognizant System Engineer – Electrical
- I&C Software SME
- I&C Support
- System Engineer responsible for Master Equipment List (MEL)
- Plant Manager/Division Director
- Operations Manager
- Production Control/Material Coordinator
- Electrical / I&C / Mechanical Planner
- TREAT Training Coordinator

Evolutions/Operations Witnessed

- Pre-Job Brief and associated Dedicated Microprocessor Testing Surveillance, 06/05/2017
- Troubleshoot/Repair TREAT East Rollup Door, 06/06/2017
- Table top discussion / planning meeting for troubleshooting ARCS Transient Simulation issue, 06/06/2017
- Craft Safety Share / Tool Box meeting, 06/07/2017
- Pre-Job Brief and associated ARCS Transient Simulation Troubleshooting Evolution, 06/07/2017
- Pre-Job Brief and associated TREAT Steady State Input Trip Logic Calibration, 06/07/2017
- *Maintenance Planning Walkdown associated with the Task to replace the Compensation and* Control/Shutdown Rod Indication Potentiometers, 06/08/2017

- TREAT Plan of the Week Meeting, 06/08/2017
- Walkdown of the Balance of Plant facilities, Reactor Filtration/Cooling System, Reactor Trip System, Electrical Distribution System, Compressed Air, and Building Heating & Ventilation System, 06/09/2017
- Walkdown Maintenance Shop facilities including welding, soldering, and I&C areas, 06/09/2017
- Emergency Preparedness Drill

DISCUSSION OF RESULTS

1. *Maintenance, Testing, and ISI (MTI) requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.*

Maintenance, Testing, and ISI (MTI) requirements are adequately implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements, properly flowed down to TREAT operations, and fully support the facility in preparation for reactor restart. This conclusion was reached based on document reviews and interviews with management and workers. In reviewing LRD-6000, Rev. 1, "Maintenance Management Requirements", it became apparent that the Maintenance Implementation Plan (MIP) requirements are adequately embedded in this document, as well as within PDD-6000 and MCP-6102. This was also confirmed during interviews, as well. Management has conducted periodic inspections of plant condition and personnel work performance in the form of Management Observations (MO) to ensure safe nuclear facility condition and housekeeping is maintained and acceptable standards of worker performance are demonstrated. A total of sixty-nine MOs were reviewed and the CRA Team concluded that a significant majority were performance based with on the spot constructive feedback provided to impacted personnel. MOs seem to have been well received by the Workers. In addition, an independent assessment of the TREAT Integrated Work Control Process was conducted within the past eighteen months that was adequately critical with corrective actions in place. As mentioned in CRAD MG5 of this report there is an opportunity for the TREAT Operations Organization to conduct more critical self-assessments. This also is applicable to the Maintenance programs.

The roles and responsibilities depicted in PDD-6000, Rev. 3, "INL Nuclear and Non-Nuclear Maintenance Management Program" were ascertained to have been adequately flowed to the facility and are in place to support TREAT reactor restart. This process, and the associated clear communication of assigned and matrixed personnel, are well documented in SP-50.0.5, "Resumption of Transient Testing Program Management Roles and Responsibilities." As an integral part of work execution, LWP-6200, Rev. 13, "Maintenance Integrated Work Control Process" places significant emphasis on hazard identification, control of hazards, and the walkdown process to ensure the worker is protected. That expectation was evidenced during a planning walkdown that was observed by the CRA Team. In preparation for replacing the potentiometers on the Compensation and Control/Shutdown Rods a work planning team was assembled to develop a work package (WO 247008, DRAFT, "TREAT 720 Compensation and C/S Rod Position Indication"). Prior to the walkdown a briefing was given to each person on the planning team regarding plant status, safety and radiological conditions in the Basement Auxiliary Room (BAR) and Sub-Pile Room, and the intended scope of the work package. Representatives from Operations, Radiological Controls, Maintenance, Planning, Industrial Hygiene, Industrial Safety, and Engineering were present. A very comprehensive discussion of safety was held and excellent input was obtained from all representatives, especially the person who will actually perform the task. This was an excellent demonstration of worker involvement in work planning. It should be noted that the scope for

this effort and the completion of this activity is the only item on the Manageable List that must be completed before the Federal readiness review. TREAT has an adequate predictive, corrective, and preventive maintenance program as required by MCP-6201, Rev. 11, "Preventive/Predictive Maintenance Program" and SP-50.3.2.1, Rev. 3, "TREAT Preventive/Predictive Maintenance Program – Supplement to MCP-6201." The Management Self-Assessment (MSA), conducted as a precursor to the CRA review, identified that Step 4.1.5 of SP-50.3.2.1 may not be implemented as written. This step in the Standard Practice states that Model Work Orders (MWO) must be reviewed and approved, at a minimum, by the Nuclear Facility Manager, Maintenance Manager, and the Cognizant System Engineer. The CRA ascertained that this issue has been resolved by reviewing completed work packages and interviews that were conducted with maintenance managers and workers.

Low voltage work was observed by TREAT Control Technicians and a task was observed to troubleshoot and repair the East Roll-up Door in the Plant (Work Order Package 00245986 01, "Troubleshoot and Repair TREAT East Rollup Door #72"). All the requirements of LI-623, Rev. 3, "Energized Electrical Work" were followed when performing the zero energy checks. In fact, a Noteworthy Practice was observed during the troubleshooting of the roll-up door. As a normal part of Lockout / Tagout (LOTO) establishment at TREAT a personalized Do Not Operate (DNO) Tag (434.12A) complete with printed name and a photo, is hung on the isolation device along with the standard LOTO DNO Tag at the point of isolation for a single point, simple LOTO and on the lock box lock for a Complex LOTO. The personalized tag provides clear information regarding who has hung the lock and personalizes the LOTO that inject a human element into what should be protected. This was noted by the CRA Team as a Noteworthy Practice.

2. *TREAT facility structures and equipment are available and adequate for safe reactor operation and the material condition of safety, process, and utility systems is adequate to support the safe conduct of work.*

TREAT facility structures and equipment were determined to be available and adequate for safe reactor operation and the material condition of safety, process, and utility systems was observed during walkdowns as adequate to support the safe conduct of work. A document review of evidence contained in the System Readiness Binders for the following selected TREAT systems (from LST-900) supported that conclusion: Balance of Plant (System-8), Reactor Filtration/Cooling System (F/CS) (System-9), Electrical Distribution System (System-10), Compressed Air (System-14), Building Heating & Ventilation System (System-15), Hoisting & Rigging (System-18), Building Structure (System-20), and Reactor Trip System (System-24) was performed. Evidence provided and interviews conducted indicated that, for each of those systems selected, there were no open Work Orders, no open issues in LabWay, and no open Engineering Jobs that would impact operability of the systems in support of TREAT operation. In addition, critical spare status was reviewed for those selected systems and it was concluded that previously listed deficiencies in the Electrical Distribution System on FRM-1799 regarding three critical spare breakers and two critical spare trip units were resolved. During the walkdown of the Electrical Distribution System the CRA Team verified that the spares had been acquired and were stored in TREAT Plant maintenance area. However, in reviewing critical spares for the Reactor Filtration/Cooling System it was noted that the minimum quantity of filters required to be in stock were not instock, but on order. Critical Spares for the Reactor Ventilation/Cooling System has been determined to be a minimum of 16 Flanders Filters on hand. Currently, the TREAT Facility only has eight Filters. The current documented condition is 50% of the required on-hand inventory and was attributed to human error since the current automatic MAX/MIN reorder restocking system is set at thirteen filter units, but a required interaction with the system did not take place as required. This inadequacy has been corrected. The currently installed filters are original equipment, but have passed all required tests and are operating as designed. TREAT Facility management recognizes the current condition and is tracking resolution. In addition, a

LabWay issue (CO-2016-1006) was noted by the Facility regarding internal corrosion in the Cooling System ducting. The Conditions Report stated that "During inspections of the lower plenum for foreign material migration, it was noted that there was rust/scale from the inside of the F/CS ducting that had accumulated in the elbow. The wall of the ducting appeared to be degraded somewhat, but the extent could not be fully captured due to the inability to manipulate the borescope. Additional inspections would be required to capture the full extent of the condition." It was determined and documented by Facility management that no action was required at the time. Since then, no additional inspections have been conducted nor have performance degradation inspections been set up on some periodicity to monitor degradation. Filtration performance is only monitored by Filter performance and DOP testing results. In addition, current practice is that non-safety related (NSR) systems do not have a System Health reporting requirement, so this condition is not being monitored through that mechanism. Current plans are to extend System Health reporting to some NSR systems, with the F/CS being one considered. However, no follow-up inspection action has been loaded into Asset Suite to ensure timely inspections are completed to monitor the duct degradation condition.

The Engineering Manager issued an Interoffice Memorandum stating "Initial data collection and trending, per LWP-10601, will be initiated for active Safety-Related (SR) Systems by the TREAT Engineering organization upon declaration of systems operability by the TREAT Nuclear Facility Manager. Other active Non Safety Related-Augmented Requirements (NSR-AR) systems that perform important defense-in-depth functions will be included, on a risk informed basis, as designated by facility line management. System health reports, for SR portions of Compensation Rods, Control Shutdown Rods, Seismic Trip and Manual Scram Systems, will be issued on a quarterly basis, with first reports issued 90 days following declaration of operability." The Cognizant System Engineers have a System Health reports issued for the four SR Systems on 6/12/17. These four reports were reviewed by the CRA Team and concluded as sufficient to support health reporting for these SR systems.

Another minor issue was recognized by the CRA Team when reviewing the documentation for the Electrical Distribution System in the System Readiness Binders. A corrective action regarding the Uninterruptable Power Supply (UPS) units (CA 2016-0003) had been closed with the following statement "use as is and the required UPS time will be reevaluated to the updated FSAR and Tech Spec before the facility is operational." The issue arose when a test of the UPS units was performed while the UPS system was covered under the previous DSA and the UPS system did not perform as required. The previous FSAR / TS credited the UPS run time as needing to last 16 hours. The UPS lasted only 13 hours during that test and then auto shutdown to protect the batteries. The current SAR-424 and TS-420 don't have stated requirements for UPS performance, only a description in Section 8.2.2 (Design Requirements), Subsection 8.2.2.1 (Operational Considerations) that states "The battery capacity of each unit supplies 2-kW single phase, 120-Vac load for approximately 13 hours." No technical justification or evaluation was provided to support the current wording in the SAR. The appropriate CSE for the system was interviewed and provided sound logic for the current status of the UPS system and why it's not required to be credited in Chapter 8 of the current SAR. However, the TREAT Engineering Manager agreed that documented justification would provide adequate rigor and history of the reasonable path to where the facility is now regarding not crediting the UPS system as Technical Specification requirements. This information is planned to be included in the next annual update of SAR-420.

3. *Procedures for surveillance and calibration testing, in-service inspection, and safety assessment of safety related SSCs are effectively implemented in support of TREAT facility reactor operations.*
    - *VSS assessments and associated system health reports have been completed as scheduled and were adequate and effective.*

- *ISIs have been performed and documented to confirm operability of the required VSSs and are current*
- *Preventive Maintenance and calibration tests have been performed and documented to confirm operability of required VSSs and are current. A system is in place for managing preventive maintenance and calibrations.*
- *Preoperational and functional tests are completed and current*
- *A surveillance tracking system is in place and effective to ensure TS surveillance requirements are completed and confirm operability of associated SSCs within their required periodicity.*
- *TS-420 surveillances are current/complete or are required as appropriate for operations.*

Procedures for surveillance and calibration testing, in-service inspection, and safety assessment of safety related SSCs are effectively implemented in support of TREAT facility reactor operations. Specifically, document reviews and field observations confirmed that determination supported by the following information. Preventive Maintenance and calibration tests have been performed and documented to confirm operability of required VSSs and are current. A system is in place for managing preventive maintenance and calibrations. In a review of PM, CM, and ISI records the following was noted:

For the TS work orders (Use Type II) that were reviewed almost all of the work orders reviewed have the following issues:

- No minimum accuracy for M&TE recorded or listed. MCP-6303 Calibration of Facility Process and Control Instrumentation, Rev 5 states that the SSC Engineer will identify required accuracy of field calibration standard and the planner will provide the minimum accuracy of the standard to be used in the work order. A couple of data sheets were selected and the accuracies of the M&TE verified. The M&TE observed was found to be over ten times more accurate than the requirement stipulated. TREAT Facility Management has agreed to and accepted this issue and plans to develop a new Standard Practice (SP) that will evaluate the INL-wide requirements of MCP-6303 and tailor them in the new SP to ensure that a graded approach for implementation at TREAT is assured.
- Application of signature is inconsistent. Almost all had briefing signatures, half had prerequisite signatures and a few had Radiological Control personnel signatures. The TREAT Organization has completed a Corrective Action Plan to resolve these issues.

The Corrective Action Plans in place are CO-2017-0913 and CO-2017-0924, respectively.

A completed calibration procedure for the hydraulic system supporting I&C equipment (WO Q236561-01 (completed 03/10/2017), MWO 229870-01, 1Y TREAT-720 - Hydraulic System I&C Equipment Calibration (TS) was reviewed. During that document review it was noted that there are two minor issues related to nomenclature clarity. Two steps refer to the same component as both the "Latch Power Supply Control Box" (Step 9.11.6 3) and the "Latch Power Supply Test Box" (Step 9.6.6). Also, Step 8.4.1 incorrectly states that "The following Technical Specification is partially satisfied by performance of this procedure." when, in fact, the performance of the procedure satisfies the associated TS SR 4.2.2.1. This is correctly stated later in the procedure in Step 11.4.3 which says "The following Technical Specification is satisfied by performance of this procedure." These items were noted as deficiencies and provided to Facility Management.

During a planned operations Reactor Startup and Transient Evolution demonstration on 06/06/2017 the ARCS system did not perform as expected. As a result, a tabletop planning session was

conducted, attended by the appropriate TREAT SMEs, and observed by the CRA Team to develop a troubleshooting and repair (TS&R) package (WO 247814, MWO 00243344-01, TREAT 720 TS&R ARCS (TS)). During the tabletop planning session, the I&C Software Engineer stated that he thought the problem was the output card to the ARCS or the input signal to the output card. The Techs said that during the program loading of a full simulation, meter movement of the RTS system would allow them to determine if the problem was before or after the output card. The actual troubleshooting and repair was observed by the CRA Team the following day. Using TREAT-OI-0502 a full simulation was started and during the program loading, meter movement was observed on the RTS panels. The Techs then disconnected the input cable from the output card to allow them to input a voltage to the card. A voltage was input on the card, but the display did not change. The card was pulled and reseated, this performed two actions as follows; power was removed from the card and the edge connector was "cleaned". Voltage was again applied to the output card, but the display again did not change. The Tech then decided to measure the output from his voltage source, to ensure the source was working correctly. A volt meter was connected to the output from the voltage source and immediately the ARCS display started working satisfactorily. The I&C Engineer and the Techs only determination from troubleshooting concluded that the volt meter loaded the circuit just enough to reset the output card. After it was determined that the ARCS Simulation Software performed as expected through the troubleshooting process a Post Maintenance Test was performed that also used steps from TREAT-OI 0502 to execute a partial transient simulation as the PMT. After a successful PMT the package was closed out and the ARCS system declared operational. This evolution had a couple of things that might be improved upon. This work order was performed using a "model" work order with a number assigned (MWO 00243344-01) in combination with a "new" work order package that was released for that specific task. The new work order number (WO 247814) is on the front page of the work package, but the model work order number is on the rest of the pages. The status log referenced the model work order number instead of the unique WO number for this task. - The planning session offered many good suggestions to do the troubleshooting. A regular work order could have captured a more complete thought process from the Techs and Engineers. The work order executed relied on the Techs to document in the work package Status Log all of the steps performed and the observed results. The steps were documented well enough to complete the work, but were not comprehensive enough to ensure full recollection and recreation of the troubleshooting efforts for a similar task in the future. It might be a good practice to either put more detail in the Status Log or write a small narrative that explains in detail the planned actions and obtained results. . In summary, the troubleshooting process worked; however, replication of the techniques used to return the ARCS system to Operable status may not be repeatable hence the need for more detail to be included in the work package. Engineering and the Techs worked really well as a team, the Techs offered good input and were treated as strong and valued contributors from the Engineers.

Immediately following the ARCS troubleshooting and repair evolution a Pre-Job Brief for calibrating the steady state input for the Trip Logic was conducted and observed by the CRA Team. The Pre-Job Brief was comprehensive and professional. Following the Pre-Job Brief a demonstration of that activity was safely and successfully performed using MWO 229929-01, 1Y TREAT-720 - RTS Steady-State Input Trip Logic Calibrations (TS). No issues were noted in the conduct of the evolution or the procedure used. It should be noted that the task to perform calibrations of the Output Trip Logic using MWO 229931-01, 1Y TREAT-720 - RTS Output Trip Logic Calibration PM (TS) was not performed as planned in the TREAT CRA Agenda due to time limitations. This schedule modification was agreed to by the CRA Team.

A Pre-Job Brief was held for the performance of procedure TREAT OI-0509, Rev. 2, Dedicated Microprocessor Tester (DMT) Operations. The Pre-Job Brief was comprehensive and professional. Following the Pre-Job Briefing the evolution to test the DMT, which verifies the functionality of the

ARCS linear and log/period intervals, was conducted. The functionality of the DMT was successfully demonstrated. During the informal discussions and interviews that followed as part of the Post-Job Review several TREAT personnel mentioned that there were minor issues with the DMT that have been informally collected by Engineering and will be acted on as part on-going operations. TREAT Management should ensure that these items are formally collected in LabWay and the proper attention given to ensure resolution. In addition, it was noted by the CRA Team that TREAT-OI-0509 has an implementing step (6.4) that ensures the Latch Key is returned to the TREAT Operations Manager, but there is no step to control or ensure the Latch Key is under lock control on the front end (Prerequisite) of the procedure. The TREAT TS have an Administrative Control to ensure proper control of the Latch Key (AC 5.10.1.7). It is recommended that an additional step be inserted in the front of the procedure (possibly associated with Step 3.5 in Section 3, Prerequisites) to demonstrate full control of the Latch Key and assurance that the AC is comprehensively met.

A document review was performed of the completed preoperational and functional tests for SSCs of selected TREAT Systems (8, 9, 10, 14, 15, 18, 20, and 24) as listed in LST-900, Rev. 9, TREAT Systems and Document Numbering Information and the CRA Team determined there were no issues.

Through the above noted observations and document reviews the CRA Team concluded that required TS-420 surveillances are complete and current to appropriately support resumption of TREAT operations.

4. *Adequate procedures, facilities and equipment are available at the TREAT facility to ensure maintenance and test processes and procedures support of safe facility operation with adequate services.*

Adequate procedures, facilities and equipment are available at the TREAT facility to ensure maintenance, test processes, and procedures support safe facility operation with adequate services. This was demonstrated through observation of a troubleshooting and repair task on the TREAT East Rollup Door and in reviewing documentation of completed corrective and preventive maintenance work on other non-safety related structures, systems, and components (SSC). The troubleshooting and repair work on the East Roll-up Door required a single point (simple) LOTO in order to perform the work. The zero voltage checks performed by the Electrician on the single disconnect switch and work performed by the BOP Mechanic was conducted safely and professionally. However, facility protocol requires that simple LOTOs be listed on the TREAT I&C Control Room Status Board in the space provided (Complex LOTOs are listed in the LOTO Log Book). This was not done for this particular maintenance evolution. When the Shift Supervisor was asked about this practice he agreed that it should have been noted on the Status Board and he simply overlooked the update required for the work that was released that day. The I&C Control Room Status Board was noted as being updated with the proper information the following day.

Recently closed CM & PM Work Packages (Work orders 229931-01 and 229929-01) were reviewed with the following results: These work orders have PMT steps that are signed off by the “Cognizant System Engineer”. There is a note at the beginning of the work instructions for notification of Engineering if tolerances can’t be met. This section does not call out the Cognizant System Engineer, one calls out the TREAT Engineer and the other calls out I&C System Engineer. The TREAT organization has accepted this issue and agreed to include correct titles in a consist manner in the work packages.

During the walkdown of maintenance shop and equipment condition and capability the CRA Team noted that adequate facilities are located within the fence boundary of the TREAT Facility. Interviews with managers, supervisors, and workers confirmed this conclusion. However, informal interviews provided information that satellite (outside the TREAT Facility fence boundary) capacity may be

needed during TREAT Transient Operations due to the requirement that personnel evacuate to outside the fence boundary. During these operational periods shop function and maintenance capability may be significantly reduced if alternate capability isn't available. Strong consideration (and funding) should be given to evaluating this potential inefficiency and understanding the cost/benefit to establishing satellite shop and work area capability outside the exclusion area during Reactor Transient operations. This initiative has been informally considered, but some formal analysis could be useful.

5. *Sufficient qualified personnel are available to effectively implement maintenance and test processes and procedures (including TS surveillance) in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing maintenance and test processes and procedures is adequate based on review of records, interviews, and observation of operational demonstrations.*

Sufficient qualified personnel were observed to be available to effectively implement maintenance and test processes and procedures (including TS surveillance) in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing maintenance and test processes and procedures was determined to be adequate based on review of records, interviews, and observation of operational demonstrations. Specifically, the TREAT Operational Staffing Plan (Interoffice Memorandum, From Broussard to Bumgardner, Subject: TREAT Operational Staffing Plan, 05/23/2017) was reviewed and discussed with Maintenance Management. In reviewing document SP-50.0.5 "Resumption of Transient Testing Program Management Roles and Responsibilities" and confirming with informal interviews of the Maintenance Managers the CRA Team determined that minimum staffing and qualification requirements are in place for TREAT Control Technicians, Nuclear Maintenance Mechanics, and Maintenance Planners. Current Training records were reviewed for the Balance of Plant Mechanic, Electricians (two), Nuclear Mechanics (two), TREAT Control Technicians (three), and Planners (two). The review indicated that all personnel were current in their training and fully qualified. In addition, it was noted that some of the workers had training requirements coming due in the next two months. The Training 30/60/90 Day Report for 06/10/2017 was reviewed and indicated that all workers were properly listed on the report, were scheduled in a timely manner for their required training, and the system (including actions provided by the TREAT Training Coordinator) would provide sufficient advance warning to ensure these training requirements would not lapse and would ensure that the affected workers would remain qualified.

6. *Prerequisites PR-7.1, PR-7.2 and PR-7.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

Prerequisites PR-7.1, PR-7.2 and PR-7.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification. The System Readiness Binder was reviewed for the readiness of all listed systems and Systems 8, 9, 10, 14, 15, 18, 20, and 24 were specifically walked down. The following summarizes the results for each Prerequisite:

- PR-7.1 Required maintenance and calibrations are current for all SR and NSR-AR and support safe conduct of TREAT operations. Based on review of Letter, CCN240014, from Bumgardner to Newbry, Subject: Contract No. DE-AC07-05ID14517-Resumption of Transient Testing Program-Documentation – Completion of TREAT Implementation of SAR-420 Revision 1 and TS-420 Revision 1 for all modes of operation, 3/1/2017 which summarized TREAT Management's position and field walkdowns, observation of surveillances, document review of completed surveillances, and interviews the CRA Team concludes that PR-7.1 has been met.
- PR-7.2 TREAT systems preoperational functional tests have been completed to confirm material condition and operability. Based on review of Letter, CCN240014, from Bumgardner to Newbry,

Subject: Contract No. DE-AC07-05ID14517-Resumption of Transient Testing Program-Documentation – Completion of TREAT Implementation of SAR-420 Revision 1 and TS-420 Revision 1 for all modes of operation, 3/1/2017 which summarized TREAT Management's position and field walkdowns, document review of completed preoperational functional tests, and interviews with TREAT Maintenance Management the CRA Team concludes that PR-7.2 has been met.

- PR-7.3 Required surveillance procedures for the TREAT activity are in place and include TS-420 Surveillance frequencies and appropriate evaluation criteria. Required surveillances have been incorporated into a recall system that will ensure surveillances are performed within the required frequencies. TS-420 surveillances are current/complete or are required as appropriate for operations. Based on review of Letter, CCN240014, from Bumgardner to Newbry, Subject: Contract No. DE-AC07-05ID14517-Resumption of Transient Testing Program- Documentation – Completion of TREAT Implementation of SAR-420 Revision 1 and TS-420 Revision 1 for all modes of operation, 3/1/2017 which summarized TREAT Management's position and field walkdowns, document review of completed preoperational functional tests, and interviews with TREAT Maintenance Management the CRA Team concludes that PR-7.3 has been met. The TREAT MSA concluded that this prerequisite had not been met. However, the CRA Team ascertained through the evidence provided that the issues identified in the MSA that led to that Team's conclusion that PR-7.3 was not met had been resolved and that PR-7.3 was now determined as met.

CONCLUSION:

This objective was met. No findings were identified. One noteworthy practice was identified. Line management has established an adequate Maintenance SMP (including Testing and In-Service-Inspection (ISI) to ensure safe accomplishment of work in support of resumption of TREAT operations. Asset Suite, the INL Computerized Maintenance Management System, is in place to confirm, recall surveillances and periodically reconfirm the condition and operability of Vital Safety Systems (VSS). Adequate facilities and equipment are available and adequate for safe facility operation and the material condition of all safety, process, and utility systems will support the safe conduct of work. This was confirmed through extensive document reviews and system walkdowns. The TREAT organization may want to consider establishing a satellite maintenance shop or work area that would be available when extended transient reactor operations preclude normal shop work. The level of knowledge of Maintenance, Test, and ISI managers and staff is adequate, training is current, and the comradery and ownership among the Technicians and Craft personnel is at a very high level.

FINDINGS

None

NOTEWORTHY PRACTICE

MTI1-NWP-1: As a normal part of LOTO establishment at TREAT a personalized DNO Tag (434.12A) complete with printed name and photo, is hung on the lock along with the standard LOTO DNO Tag at the point of lock-out. The personalized tag provides clear information regarding who has hung the lock and personalizes the LOTO by injecting a human element into what should be protected. This practice is implemented INL-wide.

Assessed by:	Rick Runnels & Tony Wilson **CRA Team Members**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Operations

Functional Area:	Objective: OPS1	OBJECTIVE MET	
Operations	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

OPS1: The formality and discipline of operations are adequate to conduct work safely, and programs are in place to maintain this formality and discipline. The level of knowledge of operations personnel (including managers) is adequate based on reviews of records, selected interviews of operations managers and staff, and observations of operational demonstrations.

CRITERIA

1. Conduct of Operations (ConOps) program requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. The applicability of DOE O 422.1 conduct of operations requirements has been documented for the TREAT facility; this applicability determination (e.g., matrix) has been approved by DOE-ID; and incorporated into TREAT ConOps processes and procedures. The ConOps principles and practices documented in these processes and procedures are adequately implemented in support of the facility.
2. The level of knowledge of operators and their supervisors and managers regarding ConOps principles and practices (e.g., command and control, procedure utilization, rounds, system status control, etc.) and their effective implementation is adequate. Operations and operations support personnel demonstrate acceptable formality, procedure compliance and discipline of operations to conduct work safely.
3. Sufficient numbers of qualified personnel and adequate facilities and equipment are available to safely conduct operations, including ConOps implementation. The level of knowledge of operators and their supervisors and managers associated with the operational processes, associated hazards and controls and the bases for those controls is adequate. Operations personnel effectively demonstrate proficiency for and ability to execute normal, abnormal, and emergency operations in accordance with approved operating procedures.
4. Prerequisites PR-12.1 and PR-12.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review ConOps procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the roles and responsibilities for TREAT facility operations.

Review the ConOps Implementation Matrix and associated DOE approval documentation

Review INL procedure compliance policy.

Review procedures governing work authorization, work release and pre job briefings for activity level work and operations to ensure these processes are formally established and effectively implemented. Review log keeping, event notification, mode change, and facility status practices and procedures.

In conjunction with CRAD PM1 review select operating procedures, associated safety related and mission essential support system procedures, TS/LCO response procedures, and other alarm response procedures, abnormal operating procedures, and emergency operating procedures.

Review a representative sampling of documents and records that validate the implementation of the ConOps at the TREAT facility. These include:

- Select management and independent assessment of operations and ConOps implementation and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of ConOps implementation; including conclusions and assigned actions by senior management
- MSA documentation for operations and the ConOps implementation
- Status and documentation of all open and recently closed specific ConOps related issues, corrective actions, and Lesson Learned.
- TS Minimum Staffing Requirements and Operations Staffing Plan
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing operations work to include confirmation that they have been trained and qualified to conduct operations and respond to process upsets and emergency events**.**
- Selected in-progress procedures and work documents associated with operations activities at the TREAT facility to evaluate the adequacy and completeness of the activity and compliance with conduct of operations principles. These are to include: activity level work authorization documentation, work release documentation, pre-job briefing documentation; round sheets, operating logs, shift turnover documents, Standing Orders, temporary modification documentation and audits, system status and equipment control documentation, other operations activity data sheets and other facility records of note. These reviews may be conducted in conjunction with interviews and observations of work provided they not impact the evolution.

Interview selected essential line operations and support personnel and key support managers and leads in order to ascertain their knowledge proficiencies and competencies. Interviews will include questions related to equipment, procedures and processes; safety related equipment, controls and requirements and their implementation; LCOs; response to contamination release and alarms and progression into accident scenarios; evacuation routes and assembly areas; role and responsibility interfaces with other support organizations; select conduct of operations principles and practices, procedure compliance and stop work responsibilities. Interviews may be conducted in conjunction with observations of work provided they not impact the evolution. Personnel interviewed will include: Operations Manager, Facility Manager, and select Shift Operations Managers, Control Room Operators, building operators and supervisors, key operations support managers and staff, Senior Supervisory Watch personnel, and the Emergency Response Coordinator.

Observe operations related meetings, pre-job briefings and work performance to validate operations are being conducted safely and effectively during routine evolutions, performance demonstrations, and drills. Some observations should also be on back-shift and weekends. Ascertain that safety management and safety requirements are integrated into work performance during the pre-job briefings.

Observe performance demonstrations using approved operating procedures. All steps of a procedure will be demonstrated, as appropriate.

Observe demonstration of select normal, alarm response, abnormal, and emergency operations. Also, if alarms occur in the field, observe response to those alarms. Observe evolutions showing response to abnormal events or training drills.

Attend meetings that discuss findings or improvement items from a drill or abnormal event, hot-wash/critique after a drill. Observations will include observation of one or more operations specific drills and hot washes demonstrating proper response of operators to process upsets and emergency events. Evaluate the effectiveness of the techniques used to simulate upset conditions when required. (Coordinate drill observations with CRAD EP1)

During these interviews and observations ascertain: (1) the adequacy and effectiveness of operating procedures and work processes under normal and abnormal conditions including their interfaces to the plant, systems, equipment, and the operating process; (2) the knowledge, proficiency, and effectiveness of operations and operations support management and staff under those conditions; and the formality and discipline of operations including procedure compliance.

Confirm sufficient operations staffing and equipment are available and minimum staffing requirements are met.

Confirm TREAT facility operations procedures and work can be followed as written and workers are following the INL procedure compliance policy.

Confirm knowledge of operators and supervisors is adequately demonstrated.

Confirm conduct of operations practices and behaviors are adequate for operator rounds, procedure use, use of system alignment checklists, control room activities, standing orders, system status and equipment control, control of temporary modifications, command and control and communication, and shift turnover.

Confirm response to alarms and abnormal conditions is effective and appropriate.

Confirm pre-job briefs, plans of the day, post job briefs, post-drill critiques, event critiques (if they occur) are adequate

Confirm work authorization and work release protocols are effective and adequate.

Reviewer: Brooks Clements (lead), Jeff Lietzow, and INL TQ SME Dwight Kraai

Records Reviewed

- TREAT Operator Aids
- Caution tags and records
- Out-Of-Service tags and records
- TREAT Timely Orders binder
- TREAT Required Reading
- TREAT Logs and Log Reviews
- TREAT Lockout and Tagout binder
- TREAT Key Control

- MCP-3955, “Conduct of Operations for the Transient Reactor Test Facility”
- SP-50.3.3.1, “TREAT Supplement to MCP-3955”
- MCP-9676, “TREAT Procedure Usage”
- LST-9000, “Conduct of Operations Conformance Matrix”
- SAR-420, “Transient Test Reactor FSAR”
- TS-420, “Technical Specifications for the TREAT Facility”
- SD-49.4.4, “TREAT Operations Roles and Responsibilities”
- LWP-9201, “Briefings”
- LWP-9600, “Conduct of Operations for the Idaho National Laboratory”
- GDE-9201, “Conduct of Operations Guidance for Laboratory Operations”
- TREAT-OI-0304, “Fuel Handling Cask Operations”
- TREAT-OI-0507, “Transient Operations”
- TREAT-OI-0504, “Reactor Operations”
- TREAT-OI-0503, “Control Rod Movement When Shutdown”
- TREAT-OI-0505, “Heat Balance”
- TREAT-OI-0703, “Filtration/Cooling System”
- TREAT-OI-0705, “TREAT Air Systems”
- TREAT-OI-0702, “TREAT Hydraulic Systems”
- TREAT-OI-0509, “TREAT Dedicated Microprocessor Tester Operations”
- TREAT-OI-0511, “Determination of Rod Worth”
- TREAT-EAR-001, “Emergency Information and Procedures”
- TREAT-EAR-002, “Loss of TREAT Power”
- TREAT-EAR-003, “Filtration Cooling System Failures”
- TREAT-EAR-004, “Compressed Air Failures”
- TREAT-EAR-005, “TREAT Alarm Response”
- TREAT-EAR-006, “Control Rod Abnormalities”
- FRM-1797, “Calibration Factors Data Sheet”
- FRM-1546, “Heat Balance Data Sheet”
- FRM-1543, “RTS Datasheet”
- FRM-1728, “Reactivity Shutdown Margin and Excess Reactivity Worksheet”
- FRM-1793, “Rod Worth Measurement Worksheet for Below Minimum Bank”
- FRM-1794, “Rod Worth Measurement Worksheet for Above Minimum Bank”

- FRM-1813, "TREAT Weekly Rounds"
- FRM-1817, "Transient Rods Bank Worth Data Summary Sheet"
- FRM-1887, "TREAT Surveillance Checks Log"
- ASMT-2016-0764, "Conduct of Operations for the Transient Reactor Test (TREAT) Facility"
- ASMT-2017-0628, "Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity"
- Management Observations evidence
- Open LabWay items
- Staffing Plan Rev.3, dated 5/22/2017

Interviews Conducted

- Nuclear Facility Manager/Operations Manager
- Deputy Operations Manager
- Shift Supervisor
- Senior Reactor Operator
- Reactor Operator
- Auxiliary Operator
- Maintenance/Engineering Manager
- TREAT Control Technician
- Transient Control Specialist

Evolutions/Operations Witnessed

- TREAT Weekly Rounds (FRM-1813)
- Demonstration of Dedicated Microprocessor Testing Surveillance (TREAT-OI-0509) including pre/post job briefings
- System startup of TREAT Air Systems (TREAT-OI-705), TREAT Hydraulic Systems (TREAT-OI-0702), Filtration/Cooling System (TREAT-OI-0703), including pre-job briefing
- Demonstration of Transient Operations (TREAT-OI-0507) including pre/post job briefings
- Demonstration of Abnormal Operations – TREAT Alarm Response (TREAT-EAR-005)
- Demonstration of Fuel Cask Handling (TREAT-OI-0304) including pre/post job briefings
- Demonstration of Heat Balance (TREAT-OI-0505) including pre/post job briefings
- Demonstration of Rod Worth (TREAT-OI-0511) including pre/post job briefings
- Emergency Drill Exercise

DISCUSSION OF RESULTS

1. *Conduct of Operations (ConOps) program requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements.*

This was demonstrated by confirming issuance and reviewing content of TREAT specific ConOps implementing procedure MCP-3955, Conduct of Operations for the Transient Reactor Test (TREAT) Facility, and review of INL ConOps procedure LWP-9600 and INL ConOps guidance document GDE-9201. The following improvement observations were made as part of reviews of implementing documents and binders containing information used in implementing the ConOps requirements of MCP-3955 at TREAT:

- (**OPS1-DEF-1**) Contrary to the requirements in MCP-3955 step 4.11 and Appendix A, log keeping of specified items does not always occur. Major system startup and shutdown, start and conclusion of significant procedures, e.g. transient reactor operations OI-0507, are not logged in the SS logbook. Additionally, it was noted that in response to abnormal conditions during demonstrations, logbook entries do not always contain a reference to the alarm or abnormal operating procedure (EAR) that is used. Since these procedures contain action steps that may be important to event reconstruction, it is recommended that reference to the alarm or response procedure be included in the logbook entries. It was also noted during the performance of the last abnormal operations drill that the drill guide, as part of section XV "Restoration Requirements" B. "Verify that all log entries say "Drill", was not performed in the TREAT logs and is not required by the procedures other than what is identified on the drill guide.
- (**OPS1-DEF-2**) Equipment Lineup SD 49.4.11 contains mark through on a number of items as either being removed from the lineup or correction to a label mismatch with the lineup. Step 4.1.4 says prepared lineups require OM approval of changes. Some lineups have first and second checks initials for all but one component (TR(7) and Inert Gas (19)). A sticky note indicates a need for a review of drawing to locate. The only date on the form is where the completion signatures are so it is not apparent when the lineups were checked to ensure that the lineup is still valid. Based on others it appears the 1st and 2nd checks were completed on 5/18/17. Gray water (13) has 1st and 2nd check signatures and dates on 5/18/17, but not SS approval as of yet. HVAC (15) lineup is blank indicating it has not been done.

  The applicability of DOE O 422.1 conduct of operations requirements has been documented for the TREAT facility; this applicability determination has been approved by DOE-ID; and incorporated into TREAT ConOps processes and procedures. This was demonstrated by confirming issuance of and reviewing LST-9000, Conduct of Operation Conformance Matrix.

  The ConOps principles and practices documented in these processes and procedures are adequately implemented in support of the facility. This was demonstrated by observation of various normal operations evolutions, and abnormal operations and emergency drills. Specific observations of issues are captured in discussion of criteria 3 below for execution of operations.

2. *The level of knowledge of operators and their supervisors and managers regarding ConOps principles and practices (e.g., command and control, procedure utilization, rounds, system status control, etc.) and their effective implementation is adequate. Operations and operations support personnel demonstrate acceptable formality, procedure compliance and discipline of operations to conduct work safely.*

This was primarily demonstrated by observations of Operations demonstrations of normal, abnormal and emergency operations. Specific observations of issues are captured in discussion of criteria 3 below for execution of operations.

3. *Sufficient numbers of qualified personnel and adequate facilities and equipment are available to safely conduct operations, including ConOps implementation.* This was demonstrated by a confirmation of the staffing levels contained within the Staffing Plan Rev.3, dated 5/22/2017, review of completed qualification and training records and equipment status review as part of criteria 3 of RA objective CM1. *The level of knowledge of operators and their supervisors and managers associated with the operational processes, associated hazards and controls and the bases for those controls is adequate.* This was demonstrated during interviews with Operations management and staff with interview questions paying specific attention to the knowledge of the TREAT Technical Specifications and the bases within. *Operations personnel effectively demonstrate proficiency for and ability to execute normal, abnormal, and emergency operations in accordance with approved operating procedures.*

   This was demonstrated by observation of normal operations evolutions as well as abnormal operations via operations drills and emergency exercise. Specific observations are noted below:

   - Observed demonstration of the Dedicated Microprocessor Tester Operations (OI-0509). The pre-job briefing used a formal checklist. It was interactive and effective, meeting procedural expectations. Verbal communications and compliance to the procedure during the demonstration met expectations. It was noted during the post-performance step 6.3, the procedure requires ensuring that RTS Transient Linear Manual Range switch is aligned per FRM-1543. FRM-1543 performs first and second checks of proper switch positions. At step 5.5.16 of the procedure, the DMT provides directions to change various switch positions. The post-performance activity in step 6.3 performs an alignment of switch positions to what had been previous independently checked without performing a new independent verification of the switch positions. This poses a potential for a single human error putting proper RTS operation into question. (**OPS1-PRE-1**)

   - Observed the demonstrations of mechanical system startup of Filtration/Cooling System (F/CS) (TREAT-OI-0703), TREAT Air Systems (TREAT-OI-0705), TREAT Hydraulic Systems (TREAT-OI-0702). It was noted that the verification of prerequisites was not always apparent, particularly for OI-0703 and OI-0705 for the ensuring equipment was lined-up in accordance with SD-49.4.11. Performance of the Instructions portion of the procedures were performed as written. In OI-0703, step 5.2.13 requires the operator to monitor the F/CS for proper operation until system parameters have stabilized. Inquiry into what parameters were observed led to the operator indicating that only audible indication of normal sound or vibration was monitored and no actual monitoring of specific equipment measured parameters. There are parameters such as filter differential pressure or blower ammeter readings that could be observed. Operations management should consider procedure revision necessary to clarify intent of the step for monitoring of system parameters. OI-0705, step 5.2.2.5 requires a check to ensure desiccant in air dryers is not pink (indicating the need to change the cartridge). The step is worded to “ensure” which indicates that the operator should act if the pink indication exists without specific direction on how to change the cartridge. Operations management should consider revision to the procedure to clarify intent of step (e.g. direct operator to submit a maintenance work request for the cartridge change, or provide steps for performing the cartridge change).

- Observed performance demonstration of Transient Operations (TREAT-OI-0507). The pre-job brief was performed using a checklist, was interactive and included a discussion of operating experience (OE) from commercial nuclear plant operation that was pertinent to the activity. The pre-job briefing exceeded expectations. The use of OE during pre-job briefs is a noteworthy practice. (**OPS1-NWP-1**) In general, verbal communications and procedure use and adherence met expectations. Specific comments on the demonstration include:
  - The procedure directs certain announcements via the PA system to the plant (e.g. "commencing reactor startup"). It was noted that the announcements were generally only made once. It was noted that, depending on the location from where the announcement was made, the clarity and content of the announcement was hard to discern. Making the announcements twice would help alleviate the issue. Given the importance of the announcement and that some actions are taken based on the announcement, management should communicate the expectations that procedurally driven announcements to the plant be made twice.
  - The SRO conducted short briefings with the RO just prior to each power escalation or change in rod configuration. Each brief was an interactive discussion of indications that would be monitored, expected response, limits of rate of change of power escalation, and response to alarms or abnormal indications. These briefs were exemplary and are considered a noteworthy practice. (**OPS1-NWP-2**)
  - During the performance of prerequisite procedure TREAT-OI-0502, TREAT Automatic Reactor Control System, Instructions, unexpected display of transient summary after the performance of the partial simulation was received. The demonstration was paused and the Operations Manager consulted with the Plant Manager and Engineering to address the issue. It was determined to initiate development of a maintenance work package to troubleshoot and repair the ARCS issue, however, for the demonstration of OI-0507, simulating acceptable partial simulation results would not impact the fidelity of the demonstration and it would continue.
  - Step 5.7.5.1 requires entering, when prompted, the PRE1 (prescription) file name from the applicable operations test plan (OTP). The operator asked for a peer check and verification of the correct file name (in this case M8MTL1). Discussion at the post-job brief indicated that there are certain steps where operator will tend to always ask for a verification of correct information before completing the computer entry (hitting the <CR>). Management should consider incorporating this check into the procedure.
  - Step 6.8 states "ensure the latch key is returned to TREAT OM" and implements the TS AC 5.10.1.7. The key was removed and directly placed into the lock box for the key that is controlled by the OM. This step was not complied with as written. Discussion with the OM indicates that he has designees that can act for him in relation to control of the latch key to comply with the TS AC 5.10.1.7 which allow for a designated alternate, and the on-watch RO that completed the step is a designee. The procedure needs to be revised to reflect the allowance for a designee.
- Observed demonstration of steady state and abnormal operations. The pre-job brief for this demonstration was not documented in that a checklist and roster was not used. The training instructor that acted as a drill controller led the discussion of how indications would be

presented to the RO/SRO and that no actual rod manipulations would be performed. He indicated that training evaluation guides (EGs) would be used for the simulations. It was discussed that TOC-929, MFC-TREAT Facility-TREAT Abnormal Operating Procedures (AOP) contained a list of the procedures that would be used including TREAT-EAR-005, TREAT Alarm Response. It was provided that, for the exercise, operations would start at step 5.4 of TREAT-OI-0507, Transient Operations. The briefing was interactive with all participants. It was noted during the performance of the alarm response that the EAR procedures are use type 4, and that the procedure use appeared to be combination of use type 4 and use type 2. The following observations were made during the abnormal operations demonstration:

- It was noted during the response to the first alarm, Reactor Coolant Low Flow, the SRO/RO were discussing EAR steps, TS operability requirements and received a simulated report from the controller that the on-line fan was stopped but the motor was running. There was more TS implication and SAR commitment discussion between the SRO/RO and then the controller announced that for the purpose of the exercise the fan had been returned to operation as if the event did not happen to prepare for continuation of the demonstration. The controller did not complete steps within the EG that tracked the operator response of securing the fan motor and starting the off-line fan and performance of steps within EAR-003, Filtration Cooling Systems Failures.
- With continuation of the demonstration it became clear that heavy controller involvement with providing simulation indication to the operators combined with the controller being able to keep track of information being provided by the operators, hampered the effectiveness of the exercise for both demonstration and potentially training purposes.
- The next abnormal event was with the announcement of a loss of indication of channel A of startup counts and reactor period, with no corresponding alarm. The RO suggested using the alarm response procedure to guide their actions. The SRO explained that the NI can be viewed from the subpile room to check for problems. The RO made a report of control/shutdown rod position and that the reactor indication on the operating channel was subcritical. The controller simulated a report from the SS that the high voltage power supply was indicating properly but that NI output in the subpile room was zero. The controller then concluded this portion of the demonstration. There was no simulated discussion between the Operations Manager and the SS or SRO of whether OM would allow reactor operations to continue in the configuration. Again, for the observation of the demonstration and potential training, the event terminated too early. As a result of these observations the RA team asked for the demonstration of an operations drill to ensure a proper review of preparation of drill planning documentation and drill execution to fully evaluate operations and training performance. This operations drill was conducted later in the assessment and is noted in the narrative below.
- The next abnormal event was a Linear Op Instrument Test/Fault alarm. Alarm procedure use, verbal communications and reactor control were performed satisfactorily. After the completion of the alarm response the controller directed that the SRO/RO continue with the power escalation. The SRO/RO brief and discussion of power escalation was excellent and modeled the noteworthy practiced observed in an earlier demonstration.

  - The next abnormal event was indication of Fuel Temp A-1 reads zero and all other fuel temps read 28 degrees C. The reactor control was satisfactory. The TS were reviewed and LCO 3.3.1 Condition A was entered and required immediate reactor shutdown. The controller interrupted at the point of actual movement of the control/shutdown rods and terminated this event in order to establish the reactor conditions for the next event, advancing to step 5.6.2 of OI-0507.
  - The next abnormal event was a "Pneumatic Pressure Lo" alarm. The RO warned of an impending reactor scram if pressure continued to lower. SRO calls SS (controller) and asks him to report rod drive air pressure. The responses were consistent with direction of the alarm response procedure EAR-005. EAR-005 directs going to EAR-004 for compressed air failures. The procedure use and adherence met expectations.
  - The last abnormal event was a "Comp Rod Hydraulic System Low Pressure" alarm. The RO recommended a reactor scram. SRO directed a scram, RO and SRO response and procedure use and adherence as well as communications met expectations.

- Observed the TREAT Fuel Cask Movement evolution (TREAT-OI-0304, Fuel Handling Cask Operations). The pre-job brief was thorough and complete with identification of hazards, risks, roles and responsibilities, "what if scenarios", and lesson learned from previous performances of this evolution. Personnel that were conducting the evolution were verified to be current with their qualifications. The evolution was performed in a safe manner, with all the required personnel, consistent with the procedure. Communications were good among the performing individuals. There were two instances where the evolution was stopped. The first was when the crane operator indicated he was going to perform a movement in a certain direction, which was not consistent with what the Auxiliary operator was anticipating. The second was when the Auxiliary Operator went to plug in the optical sensor for the cask into an outlet on top of the reactor and there was no power there. Both situations were rectified and the evolution resumed. Good Foreign Material Exclusion (FME) was employed during the evolution. The post-job brief was thorough with a questioning attitude of how the evolution could be improved.
- Observed performance demonstration of TREAT-OI-0505, Heat Balance. The actual on watch shift supervisor assumed the position of SRO for the demonstration and an off-watch SS qualified individual conducted the pre-job brief as if the on-watch SS. He did not use a pre-job briefing checklist to conduct the briefing. The briefing was interactive and included a discussion on critical steps. During the briefing, the TREAT Control Technician (TCT) asked if the FRM-1797, Calibration Factors Data Sheet, contained a place to enter M&TE information. The demonstration SS answered no, but he would enter the information in the logbook. In general, the briefing met expectations. The following items were observed during the performance of the Heat Balance demonstration:
  - The demonstration established reactor conditions of reactor at steady state conditions at 0.5×10^{-7} A (50W). After data collection, the SRO gave the order to raise reactor power to 0.8×10^{-4} A (80KW) without any briefing or discussion of indications or limits as had been previously observed. However, the RO responded to the order with providing detail on what he would observe and indications expected as part of the power escalation and rate of change limits he would observe. After the simulated power increase, data was collected (provided by controller) for fuel temperatures and values were recorded on FRM-1546, Heat Balance Data Sheet. As discussed in the

brief the establishment of equilibrium conditions was discussed with SRO/RO and for time compression (typically 6-10 hours), equilibrium was declared. Step 5.11 was completed to calculate the Heat Balance Power Level (HBPL) using the collected data. Step 5.12 requires recording this calculated HBPL value on FRM-1546 and FRM-1797. Step 5.13 requires a new calculation for voltages for each instrument listed. Step 5.14 requires recording these calculated voltages on FRM-1797 using independent verification (IV). The SRO asked the RO to complete this IV. There was a turnover of the reactor controls so the RO could perform the IV of the voltage calculation. The RO performed a check of the HBPL calculation and announced he got a different result. The SRO said he was supposed to be checking the voltage calculation. The RO said he "backed up a step" and checked the calculation of HBPL and got a different result and therefore the voltage calculation would be different. The SRO turned over control of the reactor to the RO and reperformed the HBPL calculation and discovered his error and obtained the correct result and subsequently changed the voltage calculation. Again, the SRO assumed control of the reactor to allow the RO to IV the voltage calculation. This time the result was verified. The procedure does not require an IV of the HBPL. An error in the HBPL calculation would be carried forward potentially resulting in an incorrect voltage calculation and potentially an incorrect positioning of the associated nuclear instrument with incorrect indication of reactor power level. This represents a potential for a single human error to result in an incorrect indication of reactor power and is a second example associated with finding (**OPS1-PRE-1**). During the post-job brief of the activity the facility management oversight identified the procedural calculation and IV improvements.

- Observed performance demonstration of TREAT-OI-0511, Rod Worth Determination. The pre-job brief was conducted by the SRO. No checklist was used to document the briefing. The briefing was very detailed and focused on providing context for the portion of the procedure that was to be demonstrated to the RA team observers. In general, the briefing met expectations for the watch standers performing the demonstration. The evolution is very complex and observed procedure use and adherence was satisfactory. The interaction between the SRO and RO was similar to the previous observations of the noteworthy practice of detailed briefing just prior to order for reactor power level changes.
- The Conduct of Weekly Rounds was observed using FRM-1813. The operator rounds were conducted safely and professionally. However, minor improvements can be made to the TREAT Weekly Rounds Form as follows:
  - The 130-kW diesel generator is incorrectly listed as Standby Power when SAR-420 terms it as Redundant Power diesel generator.
  - In Steps 9 and 10 the UPS systems are stated as "UPSN" and "UPSS". Their proper noun names are "UPS Normal" and "UPS Standby", respectively, per their field labeling. Informal facility naming convention terms each "UPS North" and "UPS South" which contradicts field labels and could lead to confusion.
  - A portion of procedure TREAT-OI-0801 is used to conduct an Operability Test of the UPS units. The steps followed in OI-0801 are intended to verify the correct battery and ac-output voltage ranges. In-tolerance readings for these ranges are not recorded on the round sheet and upon completion of the Weekly Round the OI-0801 procedure is discarded. The only information recorded on the round sheet is the return of each

UPS unit to "AUTO" condition after the disconnect switch is returned to the "ON" position. Unacceptable out of range readings are noted in the Comments section of the round sheet, but fluctuations within range may be useful performance data.

- The Operator Instructions on page 3 of FRM-1813 don't require the Operator performing the rounds to initial the completed round sheet, as it does for the Shift Supervisor (Step 2.c.). Even though there is a place in the Log Completion section of the round sheet for the Operator to initial, the Instructions should clearly state that requirement.

- Observed performance of Operations Drill. This drill was conducted at the request of the RA team because of items observed earlier where the events were terminated before all items in the EG had been completed or before briefings between shift supervision and operations management could be observed. The drill was executed using a TREAT Drill Guide. The drill title was "Abnormal Hydraulic Response During Power Operations". The pre-drill briefing was conducted by a drill controller and was appropriately comprehensive from the aspects of drill control and included a drill safety plan. Execution of the drill met expectations for verbal communications, procedure use and adherence, and manipulations of plant equipment.

DOE O 422.1 requires that "Contractors must implement the requirements set forth in Attachment 2, Conduct of Operations Program Requirements, which provides program requirements applicable to contracts in which this CRD is inserted." In Attachment 2 of the CRD section 2. j. "Independent Verification" it states "The operator must establish and implement operations practices to verify that critical equipment configuration is in accordance with controlling documents, addressing the following elements:

(1) structures, systems, components, operations, and programs requiring independent verification;

(2) situations requiring independent verification;"

LWP-9600, Conduct of Operations for the Idaho National Laboratory, section 4.10.2.1 says "Cognizant Operations Manager: Explicitly identify components, through procedures or other authoritative documents (such as standing directives), whose positions must be independently verified" and "Utilize accepted safety analysis methods and/or expert opinion to develop the list of equipment/components requiring independent verification." Additionally, section 4.10 says "It recognizes that any person, no matter how proficient, can make mistakes and that the likelihood that two individuals will independently make the same mistake is very low. Independent verification provides an additional measure of safety and reliability to operational activities. Experience shows that verifying, or double-checking, important operating parameters and component alignment reduces the occurrence of events caused by human errors."

Contrary to these requirements and expectations, two separate instances were identified where independent verifications were not identified in procedures relating to Reactor Trip Systems settings and calculations performed for determining reactor Heat Balance Power Level and nuclear instrument voltage settings. The lack of independent verifications identified in these procedures represent potential single human error points that could have significant impacts relating to RTS and nuclear instrumentation performance. These instances may indicate a more significant weakness in identifying in procedures those components or situations that require independent verification to prevent individual human errors from having a potential significant negative impact.

4. *Prerequisites PR-12.1 and PR-12.2 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

   This was demonstrated by review of Interoffice Memorandum to D. J. Broussard, TREAT Plant Manager, from J. R. Biggs, Operations Manager, Subject: PLN-5146, "Contract Readiness Assessment (RA) Plan of Action for TREAT Restart of Transient Testing Activity" and confirmation of the documents cited within the memorandum.

CONCLUSION

The objective was met. One Pre-Start Finding, two Noteworthy Practices and two deficiencies were identified.

Based on observations of demonstrations of operating procedures, abnormal and emergency procedures, and review of documentation, the formality and discipline of operations are adequate to conduct work safely, and programs are in place to maintain this formality and discipline. The level of knowledge of operations personnel (including managers) is adequate based on reviews of records, selected interviews of operations managers and staff, and observations of operational demonstrations.

FINDINGS

Pre-Start

OPS1-PRE-1: Contrary to the requirements of DOE O 422.1 and LWP-9600, two separate instances were identified where independent verifications were not identified in the procedures nor performed relating to Reactor Trip Systems settings and calculations performed for determining reactor Heat Balance Power Level and nuclear instrument voltage settings.

This Finding should be evaluated for Extent of Condition.

Post-Start

None

DEFICIENCIES

(OPS1-DEF-1) Contrary to the requirements in MCP-3955 step 4.11 and Appendix A, log keeping of specified items does not always occur.

(**OPS1-DEF-2**) Contrary to the requirements in SD 49.4.11, changes were made to pre-prepared lineups with receiving Operations Manager approval.

NOTEWORTHY PRACTICES

OPS1-NWP-1: The use of OE during pre-job briefs is a noteworthy practice. The OE selected was pertinent to the specific evolutions observed and helped to reinforce expectations of work performance.

OPS1-NWP-2: During reactor operation demonstrations, the SRO conducted short briefings with the RO just prior to each power escalation or change in rod configuration. Each brief was an interactive discussion of indications that would be monitored, expected response, limits of rate of change of power escalation, and response to alarms or abnormal indications. These briefs were exemplary and are considered a noteworthy practice.

Assessed by:	Brooks Clements, Jeff Lietzow, Dwight Kraai	**Approved by**:	Frank McCoy
	CRA Team Members		**CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Procedures Management

Functional Area:	Objective: PM1	OBJECTIVE MET	
Procedures Management	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

PM1: Line management has established a Procedures Management[e] SMP to ensure safe accomplishment of work and adequate and accurate procedures and safety limits are approved and in place for operating the TREAT facility process and utility systems. The level of knowledge of managers and staff responsible for administering and implementing procedures management is adequate.

CRITERIA

1. Procedure Management requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate and accurate procedures have been developed, approved and are in place for operating TREAT facility process and utility systems. The procedures encompass normal, abnormal, and emergency conditions and implement SAR-420/TS-420 safe operating parameters, requirements and controls. The procedures also include necessary revisions for all modifications that have been made to the facility.
3. Facility processes ensure that only the most current revision to each procedure is in use.
4. Sufficient qualified personnel are available to effectively implement procedures management processes and procedures in support of the facility and the level of knowledge of associated managers and staff is adequate.
5. Adequate procedures, facilities and equipment are available to ensure that procedures management support and services are adequate for safe facility operation.
6. Prerequisites PR-9.1, PR-9.2 and PR-9.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review Procedures Management program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the procedures management related role and responsibility interfaces with TREAT facility operations.

Review selected normal operation; abnormal operation; alarm response; and emergency operation procedures (including procedures that implement the safety basis)at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of

[e] Procedures Management includes activities to manage, prepare, review, approve, control, and maintain procedures

safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.

Review a representative sampling of documents and records that validate the implementation of the procedures management process and procedures at the TREAT facility. These include:

- Management and independent assessment of procedures management implementation and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of procedures management implementation; including conclusions and assigned actions by senior management.
- MSA documentation associated with procedures management implementation.
- Status and documentation of all open and recently closed specific procedures management issues, corrective actions, and Lesson Learned.
- Staffing plan for procedures management support
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing procedures management activities.

Interview selected support staff and supervision responsible for writing, reviewing, maintaining, and controlling procedures to assess their understanding of procedure management protocols and requirements, validation processes, and implementation of safety requirements. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level SMP procedures. Ascertain their role and responsibility interfaces with operations and other cognizant SME organizations.

Interview selected workers and supervisors to assess their understanding of how they verify the latest approved revision of a procedure.

Observe procedure writing and document control related meetings and field activities at the TREAT facility to validate procedure management activities are being conducted safely and in a manner that will support and sustain operations. Confirm sufficient procedures management staffing and equipment are available to support operations. Confirm that the knowledge of the Procedures Management staff and supervision is adequate.

While observing routine evolutions, performance demonstrations, and drill response; determine if the facility procedures are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements. Assess the ability of associated procedures and work documents to be performed as written and verify that procedures used by workers are properly controlled to ensure only the latest revision is used.

REVIEWER: Jeff Lietzow

Records Reviewed

- SAR-420, Rev 1, "Final Safety Analysis Report (FSAR) Materials and Fuels Complex Transient Reactor Test (TREAT) Facility FSAR"
- TS-420, Rev 1, "Technical Specifications, Materials and Fuels Complex, Technical Specifications for TREAT Facility"

- ASMT 2017-0628, Rev 0, “Final Report for Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity”
- TREAT-OI-0702, Rev 7, “TREAT Hydraulics Systems”
- TREAT-OI-0703, Rev 3, “Filtration/Cooling System”
- TREAT-OI-0705, Rev 6, “TREAT Air Systems”
- TREAT-OI-0304, Rev 4, “Fuel Cask Operations”
- TREAT-OI-0503, Rev 9, “Control Rod Movement While Shutdown”
- TREAT-OI-504, Rev 2, “Reactor Operations”
- TREAT-OI-0507, Rev 3, “Transient Operations”
- TREAT-OI-0509, Rev 2, “Dedicated Microprocessor Tester Operations”
- TREAT-OI-510, Rev 2, “Core Characterization”
- TREAT-OI-0707, Rev 3, “TREAT Gray Water System”
- TREAT-EAR-004, Rev 1, “Compressed Air Failures”
- TREAT-EAR-002, Rev 1, “Loss of TREAT Power”
- TREAT-EAR-005, Rev 1, “TREAT Alarm Response”
- LWP-9101, Rev 0, “Laboratory-Wide Procedure, INL Procedure Usage”
- LWP-9600, Rev 0, “Conduct of Operations for Idaho National Lab”
- GDE-9101, Rev 1, “Guide, Laboratory Instruction Writing Guide”
- MCP-9676, Rev 0, “Management Control Procedure, TREAT Procedure Usage”
- MCP-3955, Rev 2, “Conduct of Operations for the Transient Reactor Test (TREAT)”
- SP-50.0.2, Rev 6, “Standard Practice, TREAT Document Management Supplement to LWP-1201 and LWP-2120”
- IAS IAS16771, “TSR-400 Independent Assessment of MFC Document Control”, 4/22/16
- Memorandum, Biggs to Broussard, PLN-5146, “Contractor Readiness Assessment (RA) Plan of Action for the TREAT Restart of Transient Testing Activity”, 5/25/17
- Memorandum, Broussard to Bumgardner, “Readiness to Proceed with Contractor Readiness Assessment for TREAT Restart of Transient Testing Activity”, 6/1/17
- Memorandum, Broussard to Bumgardner, “TREAT Operational Staffing Plan”, 5/23/17
- eCR 648480, TREAT-OI-0504, 3/6/17
- eCR 648894, TREAT-OI-0708, 3/16/17
- eCR 650253, TREAT-OI-0705, 5/2/17
- eCR 650329, TREAT-OI-0704, 5/3/17

Interviews Conducted

- Shift Supervisor/Senior Reactor Operator (2)
- Senior Reactor Operator (1)
- Auxiliary Operator (2)
- Transient Control Specialist/TREAT Control Technician (2)
- Operations Manager
- Deputy Operations Manager
- Document/Records Manager
- Safety Analyst
- Reactor Engineering Lead
- Procedure Writer
- Training Coordinator

Evolutions/Operations Witnessed

- Pre/Post brief for Startup of Hydraulic/Filtration Cooling System/Air System
- Startup of the TREAT Hydraulic Systems
- Startup of the Filtration Cooling System
- Startup of the TREAT Air System
- Pre/Post brief for Testing of the Dedicated Microprocessor Tester Operations
- Testing of the Dedicated Microprocessor Tester Operations
- Pre/Post brief for Transient Operations
- Transient Operations
- Pre/Post brief for Fuel Handling Cask Operations
- Fuel Handling Cask Operations

DISCUSSION OF RESULTS

1. *Procedure Management requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements. These processes and procedures are adequately implemented in support of the facility.*

INL Laboratory wide Procedure Management and SMP requirements are contained in Procedures LWP-9101, GDE-9101, and LWP-9600, and flowed down into TREAT procedures MCP-9676, MCP-3955, and SP-50.0.2. These INL flow down requirements were reviewed and found to be contained in the applicable TREAT procedures.

MFC has conducted management independent assessments of the procedures management implementation of the MFC Document Control system and how TREAT implements its Procedure Management requirements and determined that the programs are acceptable.

TREAT Management, during the timeframe of Facility preparation, maintained and monitored a Key Performance Indicator (KPI), associated with procedures management implementation. The KPI that was being monitored was Document Readiness for Startup (Critical Operating Procedures). This KPI was monitored to determine the "Health" of the program and was reported on a quarterly basis. It should be noted that at the present time, Management is no longer monitoring this specific KPI because the procedures are near a steady state as they get ready to start up and do not anticipate large revisions to the Critical Operating Procedure set. During interviews it was determined that as the Facility transitions to an Operations mode, new KPIs will be established and monitored.

MSA documentation associated with procedures management implementation was reviewed to determine if actions have been taken to address identified issues. The MSA identified one Pre-Start finding associated with procedures management which dealt with the use of Use Type 1 and Use Type 2. In preparation for startup, TREAT made all procedures involving fuel handling, reactor operations, or other such detailed tasks as Use Type 2. To resolve the MSA finding, it was determined that the procedures which could have a direct impact to protecting the Technical Specification (TS) Safety Limit of 800°C, 0504, 0507, and 0512) would be changed to a Use Type 1. However, the procedure which contained the guidance to determine Use Type, MCP-9676, was not changed to reflect this new guidance.

Through interviews and a sampling of documents and procedures, it is determined that the TREAT Procedure Management process supports the SMP requirements and are adequately being implemented in support of the facility.

The following issues were identified during the review:

- Procedure GDE-9102, "Emergency, Abnormal Operating, and Alarm Response Procedure Writing", Section 7.4 states the immediate actions portion of an ONRI is considered Use Type 4, while the subsequent actions are considered Use Type 2. These words appear in TREAT-EAR-001, Appendix C, however, the remaining EARs do not contain this statement.
- Procedure MCP-9676, "TREAT Procedure Usage", Section 4.2.4 states in general, procedures involving fuel handling, reactor operations, or other such detailed tasks will be designated Use Type 2. A decision was made to make procedures Use Type 1 if they can directly have an impact on the TS Safety Limit, 800°C (0504, 0507, and 0512). This is contrary to the guidance given in MCP-9676.

2. *Adequate and accurate procedures have been developed, approved and are in place for operating TREAT facility process and utility systems. The procedures encompass normal, abnormal, and emergency conditions and implement SAR-420/TS-420 safe operating parameters, requirements and controls. The procedures also include necessary revisions for all modifications that have been made to the facility.*

A sampling of normal operation; abnormal operation; alarm response; emergency operations procedures; and procedures that implement the safety basis were reviewed to determine their adequacy in content, level of detail, acceptance criteria, and implementation of safety requirements. This review also evaluated if the procedures have been developed with the participation by end users and appropriate SMEs. It was determined that the procedures encompass normal, abnormal, and emergency conditions and implement SAR-420/TS-420 safe operating parameters, requirements and controls. The development and revision process, as controlled by the eCR, ensures that there is participation by all stake holders, concurred by appropriate SMEs, and approved by line management and controlled within the INL lab wide, including MFC, processes. This sampling set of procedures was reviewed and found to be technically correct and validated to be workable as written. A sampling of USQs that were performed against procedure changes was also reviewed and found to be adequate. Input from Functional Areas

OPS1, SB1, and EP1 was utilized to derive conclusions for this criterion. Refer to these Functional Areas for detailed descriptions and identified items associated with procedures.

Routine evolutions, performance demonstrations, and emergency drill response was observed by the CRA Team, specifically related to procedure use, to determine adequacy in content, level of detail, acceptance criteria, and if they properly implement safety requirements. Also, procedures were evaluated to determine if they could be performed as written, the latest version being utilized, and reflected modifications that have been made to the Facility. Interviews were also conducted to explore if individuals understood how procedures are utilized and controlled and to determine if there were any underlying concerns or issues. The evolutions and interviews confirmed that procedures are adequate in content, level of detail, can be performed as written, and reflect modifications to the Facility.

The following table reflects the effort of the CRA Team in binning procedure issues according to the descriptions in the columns for the Functional Areas shown. Each column was then considered for further evaluation to determine if there was a related systemic problem within that category. Additionally, those issues which were categorized as "Usability can be improved" were further reviewed to determine if the issues identified were technical in nature such that the procedure could not be performed as written. The CRA Team concluded that there was no systemic concern that linked the procedure issues within the identified categories. It was felt that each procedure issue stood on its own individual merit.

Objectives	Antiquated Terminology	Inadequate Flow Down From Company Standards	Inadequate Implementation of Regulatory Standards	Usability can be improved
CM1	0	0	0	0
CS1	0	0	0	0
ESH1	0	0	0	0
ESH2	0	0	0	0
EP1	3	1	4	5(3)
FP1	0	0	0	3(0)
MTI1	2	0	0	3(0)
MG1	0	0	0	0
MG2	0	0	0	0
MG3	0	0	0	0
MG4	0	0	0	0
MG5	0	0	0	0
OPS1	0	0	0	7(1)
PM1	1	0	0	1(0)
QA1	0	0	0	1(0)
RP1	0	2	3	2(0)
SB1	0	2	2	8(2)

TQ1	0	0	0	3(0)
WM1	0	0	0	0
Total	**6**	**5**	**9**	**33(6)**

( ) = Technical, could not perform procedure as written

The following issue was identified, specifically related to PM1, during the review:

- Procedure SP-50.0.2, "TREAT Document Supplement", Step 4.6.5, states if the cover sheet of the document identifies the reviewers, coordinate the review with those disciplines. Contrary to this, eCR's 648480, 648894, 650253, and 650329 do not have all the required reviews as contained on the procedure cover sheet.

3. Facility processes ensure that only the most current revision to each procedure is in use.

Procedure LWP-9600, "Conduct of Operations for Idaho National Laboratory (INL)", Section 4.16, Step 4.16.2, states that for Use Type 1 and 2, procedures are verified, prior to use, to be the most current revision of the procedure. Procedure MCP-3955, "Conduct of Operations for the Transient Reactor Test (TREAT)", Section 4.16, states that only controlled procedures may be used to direct facility operations and activities and are made from the document original on green paper. Procedure MCP-9676, TREAT Procedure Usage, Section 4.0, states to use only controlled procedures to direct facility activities and to make working copies. The TREAT Shift Supervisor (SS) is responsible for keeping controlled copy, green manuals current. Section 4.2 states that the TREAT SS maintains controlled copies of operations procedures in control areas or other locations as necessary to ensure their availability for operator use.

Through interviews and observed activities it was verified that there are adequate processes that ensure that only the most current revision to each procedure was used. The SS utilizes the INL Electronic Document Management System (EDMS) to verify and maintain controlled copy, green manuals. A sampling of procedures contained in Buildings 720 and 724 Control Rooms controlled copies, green manual, to the version as contained in EDMS, was evaluated and found to be correct. Additionally, for all of the observed evolutions, working copies of the procedures were on green paper and verified to be the current version. All individuals interviewed understood how to verify the latest approved revision of a procedure.

4. Sufficient qualified personnel are available to effectively implement procedures management processes and procedures in support of the facility and the level of knowledge of associated managers and staff is adequate.

The implementation of the procedure management process at TREAT is being implemented by the Deputy Operations Manager and one procedure writer. The process is implemented by MFC Document Control and ensures compliance with INL processes and procedures. INL maintains the Electronic Document Management System (EDMS) and Electronic Change Request (eCR) system for distribution and change control for procedures. Each TREAT procedure is assigned a Document Owner who has the responsibility for the review and maintenance of the document.

Through interviews it was determined that there is sufficient qualified TREAT personnel, with the support from MFC, to effectively implement procedures based on the current plant status i.e., ready to startup. The majority of procedures have gone through major rewrites and now only need minor modifications. The level of knowledge of the staff, including Document Owners, of the processes and procedures along with the use of EDMS and eCR, is adequate.

5. *Adequate procedures, facilities and equipment are available to ensure that procedures management support and services are adequate for safe facility operation.*

During the course of an interview with the Deputy Operations Manager, who has responsibility for implementation of the Procedure Management Program at TREAT and a procedure writer, both displayed sound understanding and knowledge concerning their roles and responsibilities for writing, reviewing, maintaining, and controlling procedures.

Field assessments indicate that there is adequate understanding of procedure management protocols and requirements, validation processes, and implementation of safety requirements. This review confirmed that interfaces exist and requirements are established and communicated between the Procedures SME, with support from MFC Document Control and other organizations responsible for providing SMEs (e.g., Operations, Engineering, safety, Radiation Control) in the procedure writing and management processes.

In completing the interviews with the Deputy Operations Manager, Procedure Writer, and a sampling of Document Owners, along with documentation review, review of controlled copies of procedures (green copies) and walk through of the Control rooms and office area, it is concluded that there is adequate facilities and equipment to fulfill the procedures management function.

6. *Prerequisites PR-9.1, PR-9.2 and PR-9.3 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

BEA has certified in writing, Memorandum, Biggs (Operations Manager) to Broussard (Facility Plant Manager) dated May 25, 2017, that prerequisites PR-9.1, PR-9.2, and PR-9.3 were complete. Additionally, Memorandum, Broussard (Facility Plant Manager) to Bumgardner (Director, Resumption of Transient Testing Program, June 1, 2017 stated that TREAT was ready to proceed with the Contractor Readiness Assessment (CRA). Sufficient evidence was provided to the CRA Team to support the certification. A sampling of this evidence was reviewed and determined to be adequate to support the BEA certification.

CONCLUSION

The objective was met. There were no findings, deficiencies, or noteworthy practices identified. Line management has established a Procedures Management SMP to ensure safe accomplishment of work and adequate and accurate procedures and safety limits are approved and in place for operating the TREAT facility process and utility systems. The level of knowledge of managers and staff responsible for administering and implementing procedures management is adequate. This conclusion was based on Procedure Management requirements being implemented through processes and procedures consistent with laboratory wide requirements, the satisfactory flow-down of requirements from the Safety Analysis Report and the Technical Specifications, adequate control mechanisms being in place to ensure that the latest revision to documents is utilized to control and perform work and activities, sufficient qualified staffing with acceptable knowledge levels of the procedure program and its implementing documents.

FINDINGS

None

NOTE WORTY PRACTICES

None

Assessed by:	Jeff Lietzow & Brooks Clements **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Quality Assurance

Functional Area:	Objective: QA1	OBJECTIVE MET	
Quality Assurance	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

QA1: Line management has implemented a Quality Assurance SMP to ensure safe accomplishment of work at the TREAT facility. The level of knowledge of managers and staff responsible for Quality Assurance is adequate.

CRITERIA:

1. Quality Assurance requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. The INL rolling three year QA audit program has been timely performed at TREAT and all issues affecting restart have been adequately closed or have a satisfactory path forward.
3. Adequate procedures, facilities and equipment are available to ensure that the Quality Assurance Program support and services are adequate for safe facility operation
4. Sufficient qualified personnel are available to effectively implement the Quality Assurance Program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the Quality Assurance program is adequate based on review of records, interviews, and observation of operational demonstrations.

REVIEW APPROACH:

Review quality assurance program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with quality assurance

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the quality assurance related role and responsibility interfaces with TREAT facility operations.

Review documentation of the rolling three year QA audit program and its results at the TREAT facility.

Review a representative sampling of documents and records that validate the implementation of quality assurance at the TREAT facility. These include:

- Management and independent assessment of quality assurance implementation at the TREAT facility and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of quality assurance implementation at the TREAT facility; including conclusions and assigned actions by senior management.
- MSA documentation associated with quality assurance implementation at the TREAT facility

- Status and documentation of all open and recently closed specific quality assurance issues, corrective actions, and Lesson Learned at the TREAT facility.
- Staffing plans for quality assurance support at the TREAT facility.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing quality assurance activities at the TREAT facility
- Procedures associated with quality assurance activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed or in-progress output documentation associated with quality assurance activities at the TREAT facility to evaluate the adequacy and completeness of the activities.

Interview selected personnel who are involved in performing, supervising, and reviewing quality assurance activities at the TREAT facility – to confirm their level of knowledge and understanding of quality assurance activities at the TREAT facility; related controls and requirements and their implementation; role and responsibility interfaces with TREAT facility operation; and the acceptability of quality assurance practices and behaviors. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures.

Observe quality assurance related meetings, pre job briefings and actual work to determine if quality assurance practices and behaviors demonstrate activities are being conducted safely at the TREAT facility and in a manner that will support and sustain operations. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Confirm sufficient quality assurance staffing and equipment are available to support operations.

Confirm procedures and work documents that implement quality assurance requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm that the knowledge of quality assurance staff and management is adequate and confirm their demonstrated commitment to comply with procedure requirements.

REVIEWER: INL QA SME – Alan Trost

LISTING OF DOCUMENTS REVIEWED:

TOC-892 “Revision 55, “MFC TREAT Standard Directives and Standard Practices”

SP-50.1.7 Revision 0 “Implementation of LWP-13014 Determining Quality Levels at TREAT”

LWP-13014 Revision 6 “Determining Quality Levels”

PDD-13000 Revision 6 “Quality Assurance Description”

SAR-420 Chapter 17 Revision 1, “Quality Assurance”

SAR 400 Chapter 14 Revision 7, “Quality Assurance Standardized Analysis Report”

SD-49.2.1 Revision 4, “Roles and Responsibilities for TREAT Program Oversight and Assurance and TREAT Training”

LWP-13730 Revision 8, “Performance Assurance and Assessment”

IAS16502 “Transient Testing Program Engineering Job Assessment” Management assessment

IAS16458 “Audit of INL QA Program Implementation at TREAT”

IAS16458 “Transient Testing Program QA Year 3 Interval Audit”

IAS16879 “Implementation of the USQ Process for the TREAT facility”

IAS15730 Independent Audit of the INL QA Program Implementation at the Transient Testing Program”

IAS161152 “Transient Reactor Test Facility Issues Management Assessment”

ASMT 2017-0127 “INL QA Program Implementation Audit at Treat year 1”

ASMT 2016-1166 “INL QA Sweep Audit”

LWP-13410 Revision 4, “Planning, Performing, and Documenting Inspection for Acceptance”

LWP-13620 Revision 17 “Software Quality Assurance“

LST-969 “Transient Testing Program Configuration Item List”

PLN-5289 “Software Management Plan for the Transient Testing Program”

Work Order 247878-01 “TREAT 720 Measure and Mark Cast Gage”

LWP-13840 Revision 8, “Issues Management”

LWP-13735 Revision 1, “INL Management Observation Program”

LWP-13830 Revision 7 “Control of Nonconforming Items”

SP-50.3.2.0 Revision 1, “TREAT Material Acquisition and Staging Process”

LISTING OF PERSONNEL INTERVIEWED:

TREAT Quality Engineer

Site QA Manager

Oversight and Assessment Manager

Contractor Assurance Audit SME

TREAT SQA SME

INL SQA SME

Training Coordinator

Maintenance/Operations operator

Maintenance/Operations operator

LISTING OF ACTIVITIES OBSERVED:

- A walk through of the TREAT facility specifically looking at the QA storage area 6/7/2017
- Inspection Review TREAT Facility maintenance room, 6/7/2017
- Inspection Activity MFC Inspection area, 6/7/2017
- Plan of the Day meeting TREAT Facility 6/8/2017

- Weekly Treat Issues Management Meeting 6/8/2017

RESULTS OF REVIEW:

1. *Quality Assurance requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.*

Roles and responsibilities for adherence to the Quality Program and configuration management rigor for safety and non-safety requirements are defined in SAR-420 Section 17. This Section hands off to SAR-400 "Quality Assurance Standard Safety Analysis Report" Section 14. This section defines the overall program or management system established to assign QA responsibilities and authorities, define QA policies and requirements, and describe processes for controlling the performance and assessment of work. In addition to SAR 400 Section 14 Standard Directive SD-49.2.1 "Roles and Responsibilities for TREAT Program Oversight and Assurance and TREAT Training", describes the roles and responsibilities of the TREAT Facility Program Oversight and Assurance Department and the TREAT Training Department. These responsibilities include ensuring the proper implementation of Idaho National Laboratory (INL) policies and procedures in the TREAT areas of operational readiness, assessment (self, management, and independent), issues management, and performance monitoring for TREAT Program. The TREAT Program has additional documents that help implement the Quality Program including policies, procedures, and performance metrics in support of TREAT program-readiness management, issues management, and assessments. The TREAT site-interface management groups oversees the TREAT issues management process to ensure on-time, efficient, and effective quality corrective action plans (CAPs) are established to prevent issue reoccurrence. Based on a review of the TREAT program documents and interviews with management and personnel is was clear that the TREAT program adequately documents the INL Quality Program.

Interviews with the Quality Assurance Lead, and review of organization charts, indicates that an acceptable level of independence exists to assure quality functions are adequately performed. These interviews also indicated that there are sufficient personnel available to support the restart and the Quality Assurance Lead and other operations personnel clearly understand their roles and responsibilities to assure Quality requirements. One suggestion for improvement would be would be to copy the Quality program requirements into the TREAT SAR-420 Section 17 rather than just hand off to SAR 400 Section 14. The SAR-420 Section 17 is a required read for TREAT personnel. This required read is used to document the Quality requirement that TREAT management has been trained to the INL Quality Program

It was clear based on the interviews performed that all TREAT personnel are responsible for complying with work controlling procedures in their work activities, checking and verifying the quality of their work, identifying and reporting problems, stopping or correcting work activities that do not meet the established quality requirements and assuring all work is conducted in a safe manner consistent with the safety basis.

2. *The INL rolling three year QA audit program has been timely performed at TREAT and all issues affecting restart have been adequately closed or have a satisfactory path forward.*

TREAT Management perform or delegate management assessments activities to evaluate the adequacy and effectiveness of the Quality management systems and identify problems that hinder achievement of objectives. Managers assess activities such as strategic planning, work processes, planning, organizational interfaces, cost control, uses of performance indicators, training and qualifications, and supervisory oversight and support.

Independent audits measure the quality of items and activities, evaluate the adequacy of work performance, and promote improvement. Independent audits were used to evaluate the effectiveness of the management processes that affect work performance, including planning, program support, and training. Independent audits focus on improving output quality and process effectiveness. Audit frequencies specified in the INL Quality Management System were implemented through the TREAT audit schedule. All audits were scheduled and performed as required. All the criteria was covered for both the 2016 and 2017 calendar years. Several Management assessments were completed as required. The audit techniques observed used direct observation of work, interviews, document reviews, inspections of facilities and equipment, and observation of drills and exercises. The extent of the effort expended by managers and to perform audits is commensurate with the risk associated with the program or activity being evaluated. Audit results, including findings and concerns, are documented.

Issues resulting from the audit activities were entered into the issues management system tool (LabWay). All quality issues, including Software Quality Assurance concerns that would affect the restart were adequately closed.

3. *Adequate procedures, facilities and equipment are available to ensure that the Quality Assurance Program support and services are adequate for safe facility operation.*

Treat Management and personnel are required to implement the Quality requirements through implementing procedures and processes. Functional responsibilities and levels of authority are identified in roles, responsibilities, accountabilities, and authorities documents, which are developed for each management position and for groups of employees with similar functions, and in employee position descriptions, which are developed for each employee.

Work is performed under controlled conditions using work-controlling documents such as approved procedures, drawings, instructions, work packages, or other appropriate means. Work-controlling documents at the TREAT facility contain provisions and acceptance criteria (when appropriate) needed to perform work. Operations and Quality work-controlling documents are developed, reviewed, approved, issued/released, and controlled. The documents identify authorities, responsibilities, interfaces (both internal and external as appropriate), and performance criteria required to successfully complete the work. Work directions provide a level of detail commensurate with the risk, complexity, and importance of the work.

Work instructions, procedures, drawings, and work packages were developed, reviewed, verified, qualified as appropriate, and approved by designated individuals. Those documents were written to integrate appropriate requirements from applicable documents and standards. Instructions, procedures, and work packages identified caution statements and any coordination with other organizations needed to successfully complete the work. When appropriate, briefings were held prior to work performance.

Controls were implemented to ensure that items are identified, maintained, and controlled to provide traceability and prevent the use of incorrect or defective items. Implementing procedures detail the methods for identifying and controlling items received or manufactured. Specific identification and traceability requirements specified in codes, standards, or specifications were applied through work-controlling documents.

4. *Sufficient qualified personnel are available to effectively implement the Quality Assurance Program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the Quality Assurance program is adequate based on review of records, interviews, and observation of operational demonstrations.*

Discussions with the Training and Assurance Manager and the TREAT Quality personnel and other individuals that support quality activities indicate that there is sufficient qualified staff to support Quality Assurance responsibilities defined in programmatic procedures, such as procurement, Software Quality Assurance, audits and surveillances, M&TE, inspection and testing, etc.

The TREAT Software Quality Assurance plan was designed to ensure the implementation and work processes to establish and maintain control of software. This plan is used to formulate a structured methodology for the planning, acquisition, development, maintenance, operations, and retirement of software.

Inspections and tests were performed in accordance with approved procedures to verify conformance with specified requirements. Inspection and test activities observed were planned and controlled in accordance with procedures, and instructions. Inspections and tests performed for acceptance were performed by qualified individuals who have not performed or supervised the work being inspected or tested. Results of the independent inspections and tests were documented, verified as acceptable, and maintained as records. Records identified the item examined, date of examination, examiner, equipment used, inspection criteria or reference documents, results and acceptability

To address the level of knowledge managers and staff have of the TREAT Quality Assurance Program there is objective evidence in TRAIN (INL Training database) that plant managers have read SAR-420 Section 17 “Quality Assurance”. This section of the SAR refers to SAR 400 Section 14 Quality Assurance that describes in detail the Quality Assurance expectation and requirements.

Based on interviews performed and attendance at the weekly TREAT Issues Management meeting it was clear that TREAT Management understood the Issues Management System which consists of the basic elements of identification, reporting, evaluation, and correction of a broad range of workplace conditions. This process is used to document failures, malfunctions, deficiencies, defective items, non-conformances, and conditions or actions that have a reasonable potential to cause adverse operational, environmental, safety and health, or quality assurance consequences. Appropriate pre-screening was observed to, categorize, assign cause analysis, and corrective actions to ensure the necessary level of rigor was applied for resolution. The Issues Management System used a graded-approach for the evaluation and resolution of the issues.

CONCLUSION:

This objective was met. There were no findings or noteworthy practices identified.

The TREAT Quality Assurance Program was evaluated through a combination of personnel interviews, document reviews, and observations, and found to be sufficiently implemented to support the TREAT Re-start activity. There are sufficient and compliant program documents, procedures, and processes in place, as determined by this review of the TREAT Quality Program implementation review. There are adequate personnel, facilities, and equipment to support quality program requirements based on interviews with Quality Assurance and Operations personnel. There were no issues related to the TREAT implementation of the Quality Assurance Program.

FINDINGS:

None

NOTEWORTHY PRACTICES:

None

Assessed by:	Alan Trost **CRA Team Members**	**Approved by**:	Frank McCoy **CRA Team Leader**

Assessment Form

(FORM 1)

Radiological Protection

Functional Area:	Objective: RP1	OBJECTIVE MET	
Radiological Protection	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

RP1: Line management has established and implemented a Radiological Protection (RP) Safety Management Program (SMP) to ensure safe accomplishment of work. The level of knowledge of Radiological Protection managers and staff is adequate.

CRITERIA

1. RP requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. RP permits are effectively implemented in support of the facility.
3. Adequate procedures, facilities and equipment are available to ensure that RP support and services are adequate for safe facility operation. Radiological instruments and equipment required for support are available and calibrated.
4. Sufficient qualified personnel are available to effectively implement the RP program in support of the facility. The level of knowledge of managers and staff responsible for implementing the RP program is adequate based on review of records, interviews, and observation of routine evolutions, performance demonstrations, tabletop exercises, and operational and emergency drills.
5. RP personnel have demonstrated proficiency for normal, abnormal, and emergency operations and have demonstrated acceptable abnormal and emergency event response during routine evolutions, performance demonstrations, tabletop exercises, and operational and emergency drills.

APPROACH

Review RP program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with RP.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the RP related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of RP at the TREAT facility. These include:

- Management and independent assessment of RP implementation at the TREAT facility and issues management documentation for issues identified through those assessments.

- Presentation material and other documents used to support senior management review of the "health" of RP implementation at the TREAT facility; including conclusions and assigned actions by senior management.
- MSA documentation associated with RP implementation at the TREAT facility
- Status and documentation of all open and recently closed specific RP issues, corrective actions, and Lesson Learned at the TREAT facility.
- Staffing plans for RP support at the TREAT facility.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing RP activities at the TREAT facility
- Procedures associated with RP activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed or in-progress output documentation associated with RP activities at the TREAT facility to evaluate the adequacy and completeness of the activities including: Radiological Work Permits (RWP) – both general and job specific; radiological surveys; results of shielding verification; calibration records for installed radiological monitoring equipment; ALARA reviews; air monitor placement evaluations; stack gas monitors; personnel monitoring; etc.

Interview selected personnel who are involved in performing, supervising, and reviewing RP activities at the TREAT facility – to confirm their level of knowledge and understanding of RP activities at the TREAT facility; related controls and requirements and their implementation; role and responsibility interfaces with TREAT facility operation; and the acceptability of RP practices and behaviors. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures. Personnel interviewed will include: Radiological Protection Manager, Radiological Protection Supervisors, radiological work planner, radiological engineer, select Radiological Protection Technicians, select operations and maintenance staff regarding radiological hazards.

- Observe RP related meetings, pre job briefings and work in the field to validate RP activities are being conducted safely and in a manner that will support and sustain operations. Observe evolutions associated with routine surveys, including instrument pre-checks and record preparation, radiological support for operations and radiological work demonstrations. Observe select operating and testing evolutions for specific RAM and CAM units. Observe RP personnel performance and integration with operations during routine evolutions, performance demonstrations, tabletop exercises, and operational and emergency drills. Walk-down TREAT radiological areas to observe air monitor placement and condition, radiological control boundaries and postings, radiological survey maps, etc. Walk-down RP offices and work areas and equipment.

- Confirm sufficient RP staffing and equipment are available to support operations. Confirm RP personnel are fully integrated with operations. Confirm procedures and work documents are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements. Confirm that the knowledge of the RP technicians and supervisors is adequate and that RP technicians are following the laboratory procedure compliance policy.

Reviewer: Jerry Kurtz

Records Reviewed

- 2015, "4th Quarter Air and Area Dosimeter Reports"
- 2016, "All Quarters Air and Area Dosimeter Reports"
- 361.68E, Rev. 02, "Operations Drill Safety Plan, TRED007P"
- 441.02, Rev. 09, "Personnel Contamination Record"
- 441.75, Rev. 5, "Monitoring Team Briefing Worksheet"
- 441.77, Rev. 3, "Monitoring Team Survey Data"
- 441.82, Rev 09, "Alpha-Beta Counter Performance Record, Ludlum 3030, 803146, Dated 3-22-2017"
- 441.A34, Rev 3., "INL Radiological Control Routine Sheets - various"
- 441.A81, "RCE-TREAT-2016-001, INL Radiological Control Evaluation Form"
- 441.A81, "RCE-TREAT-2016-003, Radiological Control Evaluation Form"
- 441.A81, "RCE-TREAT-2017-001, Radiological Control Evaluation Form"
- 441.A81, "RCE-TREAT-2017-002, Radiological Control Evaluation Form"
- 441.A81, "RCE-TREAT-2017-003, Radiological Control Evaluation Form"
- AFTF0HPT, Rev. 2, "TREAT HPT OJT Checklist"
- ASMT 2016-0668, "TREAT RadCon, Assessment"
- BOF2017001, Rev 00, "RWP TREAT – Initial Response to Abnormal Radiological Situations"
- BOF2017004, Rev 00, "RWP TREAT – Work in Contamination Areas"
- BOF2017005, Rev 00, "RWP TREAT – Health Physics Technician (HPT) Routine Radiological Activities"
- BOF2017006, Rev 1, "RWP TREAT – Fuel Handling Cask and Loop Handling Cask Operations"
- BOF2017008, Rev 00, "RWP TREAT – Reactor Building Reentry after Transient Operations"
- Canberra Charged Particle Detector Introduction, C40424
- Canberra PIPS Detector Data Sheet
- ECAR-2590, Rev. 3, "Facility Basis Document for Radiological Monitoring – Transient Reactor Test (TREAT)"
- EPI-56, Rev. 6, "MFC Facility Emergency Radiological Monitoring"

- Form 441.A83, RWP Cue Card (Trip Ticket)
- FRM-1390, Rev. 1, "MFC Personnel Decontamination Facility Checklist"
- FRM-1447, Rev. 3, "MFC RadCon Spill Kit Emergency Cart Portable Decontamination Kit Inventory Checklist"
- FRM-1778, Rev. 1, "TREAT Transient Radiological Data Sheet"
- FRM-1824, Rev. 0, "MFC 724 and MFC 722 Radiological Control Inventory Checklist"
- GDE-381, Rev. 4, "Radiological Visual Survey Data System (VSDS) User's Guide"
- GDE-471, Rev. 2, "Radiological Control Electronic Logbook"
- GDE-721, Rev. 1, "INL Radiological Instrument Manual"
- HPT qualification records - various
- HPT Supervisor qualification records
- IAS15516, "TREAT Quarterly Review of Low Hazard RWPs – 2nd Half 2014"
- IAS15868, "TREAT Quarterly Review of Moderate and High Hazards RWPs – 1st Quarter Calendar Year 2015"
- IAS15970, "TREAT Quarterly Review of Moderate and High Hazards RWPs – 4th Quarter Calendar Year 2015"
- LabWay items – 12 months
- LI-15003, Rev. 4, "Routine Radiological Control Surveys, Source Checks, and Filter Change at BOF Areas"
- LI-15034, Rev. 3, "Canberra ICAM Operation"
- LI-528, Rev. 2, "Laboratory Instruction for Use of the Fog Machine for Smoke Testing"
- LI-598, Rev. 3, "Performing Radiological Air Monitoring"
- LI-627, Rev. 2, "Personal Air Sampling Using SKC Legand Legacy Pump"
- LRD-15001, Rev. 5, "Radiological Control Manual"
- LWP-15002, Rev. 3, "Glovebags/Enclosures/Sleeves for Radiological Control"
- LWP-15003, Rev. 1, "Large Area Containments"
- LWP-15006, Rev. 7, "Radioactive Source Control"
- LWP-15007, Rev. 2, "Health Physics Instrumentation"
- LWP-15008, Rev. 4, "Use of Vacuum Cleaners and Portable Air Handling Equipment in Radiological Areas"
- LWP-15009, Rev. 3, "Radiological Work Permits"
- LWP-15010, Rev. 8, "Personnel Radiological Surveys"
- LWP-15011, Rev. 4, "Radioactive Material Areas, Handling and Storage"
- LWP-15012, Rev. 10, "Issuing Dosimeters and Obtaining Personnel Dose History"

- LWP-15013, Rev. 4, “Radiological Control of Personnel Administered Radiopharmaceuticals”
- LWP-15014, Rev. 6, “Radiation Protection for Embryo/Fetus”
- LWP-15015, Rev. 10, “Response to Abnormal Radiological Situations”
- LWP-15017, Rev. 8, “Radiological Release Surveys”
- LWP-15018, Rev. 11, “Radiological Personal Protective Equipment”
- LWP-15019, Rev. 8, “Access Controls for High and Very High Radiation Areas”
- LWP-15025, Rev. 1, “Radiological Hold Points”
- LWP-15027, Rev. 0, “Multiple Whole Body and Extremity Dosimeters”
- MANUAL-IPCM12, May 2010, “Installed Personnel Contamination Monitor”
- MCP-1, Rev. 7, “Radiation Dose Reporting, Risk Counseling and Special Dose Control Levels”
- MCP-139, Rev. 23, “Radiological Surveys”
- MCP-148, Rev. 13, “Personnel Decontamination”
- MCP-15009, Rev. 3, “Radiological Work Permit Preparation”
- MCP-187, Rev. 16, “Radiological Control Posting and Labeling”
- MCP-2383, Rev. 12, “Area Monitoring Dosimeters”
- MCP-3347, Rev. 1, “Hot Particles”
- MCP-3352, Rev. 0, “Radiation Shielding”
- MCP-352, Rev. 9, “Radiological Air Monitoring Requirements”
- MCP-9, Rev. 13, “Radiological Control Log Keeping”
- PDD-1073, Rev. 18, “Radiological Control Training and Qualification Program”
- PDD-15001, Rev. 1, “Air Monitoring Technical Basis”
- “PEMP Status Report by Objective 4.1”, 04/17/2017
- PLN-5350, Rev. 0, “TREAT Reactor Start-up Radiological Survey Plan”
- Position Descriptions HPT Tech 4 and Tech 5
- Radioactive source checkout sheets - various
- Radiological Survey, M-20160526-39
- Radiological Survey, M-20160526-50
- Radiological Survey, M-20160602-25
- Radiological Survey, M-20160714-19
- Radiological Survey, M-20160721-60
- Radiological Survey, M-20161221-46
- Radiological Survey, M-20170103-78

- Radiological Survey, M-20170120-12
- Radiological Survey, "M-20170120-14"
- Radiological Survey, "M-20170120-4"
- Radiological Survey, "M-20170125-11"
- Radiological Survey, "M-20170125-25"
- Radiological Survey, "M-20170125-37"
- Radiological Survey, "M-20170125-49"
- Radiological Survey, "M-20170125-9"
- Radiological Survey, "M-20170131-64"
- Radiological Survey, "M-20170131-64"
- RP-PCM-107, "iPCM-2 Performance Test Documentation, dated 03/20/2017"
- SAR-420, Rev 1, "Final Safety Analysis Report for Transient Reactor Test Facility"
- SD-49.4.4, "TREAT Operations Roles and Responsibilities"
- SD-49.7.1, Rev. 2, "Maintaining TREAT Radiological Control Emergency Response Supplies"
- Source calibration certificates – various
- TEV-2274, Rev. 0, "TREAT Naturally Occurring Radioactive Material Evaluation Policy"
- TEV-2282, Rev. 1, "Technical Basis Document for TREAT Radiological Surveys"
- TEV-2518, Rev. 0, "Thermo iPCM-12 Installed Personnel Contamination Monitor"
- TEV-2983, Rev. 0, "Technical Evaluation of Cleaning Methodologies in the TREAT Radiological Buffer Area"
- TJA-12009-2, Rev. 3, "Conduct and Evaluate On-The-Job Training"
- TPR-6366, Rev. 16, "Personnel Contamination Monitor Checks"
- TPR-6405, Rev. 17, "Radiological Control Sample Counter Checks"
- TPR-7325, Rev. 10, "Portable Health Physics Instrumentation Operational and Performance Checks."
- TPR-7728, Rev. 7, "Canberra ISOLO Alpha-Beta Counting System Operation"
- TREAT 2018 Assessment Schedule
- TREAT Operations Radioactive Source Index/Inventory/leak tests
- TREAT Organization Chart
- TREAT Radiological Control Radioactive Source Index/Inventory/leak tests
- TREAT-OI-0304, Rev. 4, "Fuel Handling Cask Operations"
- TREAT-OI-0400, Rev. 3, "Minimum Radiological Monitoring at TREAT"
- TREAT-OI-0504, Rev. 2, "Reactor Operations"

- TREAT-OI-0507, Rev. 3, "Transient Operations"
- TREAT-RAD-001, Rev. 1, "TREAT Radiation Area Monitor Checks"
- TRED008P, 6-14-2017, "Operations Drill Safety Plan"
- TRED008P, 6-14-2017, "Operations Drill assignments"
- TS-420, Rev 1, "Technical Specifications for the Transient Reactor Test Facility"

Interviews Conducted

- HPT - 4
- Balance of Facilities (BOF) Radiological Control Manager
- INL Radiological Engineering Manager
- TREAT Radiological Engineer
- TREAT Shift Supervisor - 2

Evolutions / Operations Observed

- Reactor Startup for Transient Operations
- Fuel Handling Cask evolution
- Pre-Job for Operation abnormal drills
- Senior management interviews
- Radiological Control routines
- TREAT Emergency Exercise Controller/Evaluator Briefing
- TREAT Emergency Exercise
- TREAT Abnormal Operational drills

RESULTS OF REVIEW:

1. *RP requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.*

The Radiological Control Safety Management Program (SMP) has been effectively implemented at TREAT. The Integrated Safety Management System (ISMS) program is effectively implemented in all operations. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- MCP-139, 4.3.7, allows documentation of swab samples in "dpm/swab". This may not be accurate since instruments are calibrated and source checked with sources that approximate the active area of the detector or a standard swipe which gives a more uniform ionization/response. In the case of a swab, the small area affects the instruments ability to accurately measure the quantity of radioactivity present due to the non-uniformity of the detector/source geometry.

- Contrary to MCP-187, 4.3.2, The Controlled Area signs on the vehicle access gates are posted on the gate itself and not adjacent. This results in the sign not being visible when gates are open. Adequate room exists on each side of the gate to attach signs.
- A walk down of facility radiological posting finds that the posting is in order and compliant with MCP-187 except as noted above.

RP1-DEF-1: Contrary to LWP-15006, Californium 252 sources stored in the TREAT facility are not entered in the INL Radioactive Source Control program.

- Contrary to LWP-15006, Californium -252 (Cf-252) sources are not contained in the INL source control program. This material is contained in several 55 gallon drums located in the south bay of the facility. The material was moved to TREAT during the inactive period by the then facility owner due to material balance issues at the originating facility. Once the TREAT facility was re-activated, the material became TREAT's to handle. The TREAT Nuclear Material database identifies these items as sources with serial numbers and decayed content.
- A review of one year of radiological control related LabWay data found few, TREAT Radiological Control, internally identified issues. Most are from external or INL assessment related sources. This indicates an organization that is not reporting conditions identified during the normal course of work. Not self-identifying problems limits an organizations ability to track and trend performance in order to identify issues early.

Reactor Startup for Transient Operations

The radiological control operations were performed satisfactorily. Good three-way communications were observed. Excellent peer checking occurred during actions. HPTs were well versed on the evolution. The pre-job was performed satisfactorily. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- TREAT-OI-0504, does not identify required posting for reactor operations. General statements are given to ensure "radiation barriers" are in place. SAR-420 predicts dose rates of > 500 mrem/hour on top of reactor shielding blocks and 5 Rem/hour in subpile room, during steady state 120 kilowatt (kw) operations.

Of concern is the subpile room, where at those radiation levels, physical controls are required. LWP-15019 specifies the physical controls for this type of area. The top of the reactor, depending what the reactor power level is, at some point will become a High Radiation Area (HRA). Access to the facility is allowed up to 120 kw reactor power. During the transient startup evolution, radiation surveys are only performed at the subpile room door, which can provide an idea of radiation levels within the room, but this data is not adequate to support Radiation Area (RA) posting.

Health Physics Technicians (HPT) stated that if their survey at the door indicated a HRA, the posting would be updated. If the radiation survey indicated > 1Rem/hour, then they would request operations to lock the door. However, since the facility is evacuated during transient operations and no one can enter without satisfactory entry survey results, this practice is acceptable. The situation would be remedied before general access is restored. Alternatively, during steady state operations, up to 120 kw reactor power level, general access is allowed to the facility. In this case, the affected areas could reach high radiation levels with postings that allow access and no physical controls, before the condition was identified by HPTs.

In summary, radiological posting should be based on the profile of the Operational Test Plan (OTP) for the evolution. Depending on the reactor power level the transient is started from or the steady state power level to be maintained, the radiological engineering staff should be able to determine the minimum

posting to start the evolution with subsequent HPT verifications. The standard, currently in use, posting at top of reactor, subpile room, and fan room may not be adequate.

Fuel Handling Cask Demonstration

Observations of the Fuel Handling Cask evolution found that radiological controls for the job are adequate and HPT surveys were performed as per procedure and as expected. Good three-way communications and peer checking were used. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- Cask Height Gauge, drawing 621204, was used to measure cask height during performance of Fuel Handling Cask Operations, TREAT-OI-0304. The tool is not mentioned in the procedure in either required tools and equipment or at any step. Since this tool is being used to satisfy a Technical Specification requirement, it should be in the procedure. During follow-up on Cask Height Gauge use, it was determined the tool was built from an engineering sketch and subsequently an as-built drawing was created. Since as-builts bypasses the Unreviewed Safety Question (USQ) process, it was discovered that no USQ evaluation was performed when the gauge was built and no documentation was found to verify it had been accepted by Operations for use.
- One of the drums containing CF-252 in south bay, is damaged. Top is deformed.
- The Fuel Handling Cask procedure contains survey steps that are inconsistent. Some steps specify the type of survey required and some don't.
- During Fuel Handling Cask demonstration, the HPT surveying the interior of the cask alignment pan inserted his arm beyond limit of his Personal Protective Equipment (PPE) (veterinary glove). His arm was inserted up to the armpit. This was a Management Self-Assessment (MSA) item that was closed by the use of the veterinary glove.
- HPT surveys following cask pick from the floor, consisted of a Large Area Wipe (LAW) only. All other surveys consisted of LAW and smear.
- The review team was unable to ascertain if scrubs with mesh pockets have been evaluated for effects on dosimetry response (Shallow dose).
- Many more HPT surveys were performed than stated in TREAT-OI-0304. When the Lead HPT was asked if the procedure only specified the important surveys and the others were good practice, he stated that all are important. TREAT should evaluate and ensure the procedure contains needed survey steps.
- Security sign on drive in fence gate stipulates "... No...cameras, recording, or transmitting devices..." Sign on access road says same thing. Sign on guardhouse door does not contain these prohibitions. Cell phones and other devices are routinely taken in facility.
- LWP-15006, does not indicate a form to use for sealed source inventory. It only mentions placing sources in an inventory. This can result in inconsistent information about sealed sources from custodian to custodian. This is an issue with the company program.

Program Assessments

A review of the TREAT assessment database, found four assessments related to radiological control. Three are related to periodic reviews of Radiological Work Permits (RWP). The fourth is an assessment of TREAT’s implementation of selected elements of the radiological control program. Seven objectives were evaluated. A review of the assessment report found the review was a not a deep dive of program

implementation. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- No radiological control assessments are on the TREAT 2018 Assessment Schedule.
- Based on the data provided, routine self-assessments, including MOPs are not being performed on all functional areas of the radiological control program.
- A review of the Management Observation Program (MOP) data for 2nd quarter 2017 (provided), found no management observations by radiological control management or other radiological control personnel.

Additionally, during review of this criterion, the review team identified the following noteworthy practices.

RP1-NWP-1: Use of scrub clothing with mesh pockets to contain hanging items

- Workers were observed using scrub clothing with mesh front pocket to contain their badges, dosimetry, etc. Prevents this equipment from not only being lost when using Foreign Material Exclusion (FME) controls, but would be useful for any job where people are routinely observed fighting their lanyards from getting in way of work or radiological hazards.

RP1-NWP-2: Use of electronic radiological logkeeping

- Electronic logkeeping allows radiological control personnel to make a log entry from any computer, concerning the work they performed. This can be entered by facility and pulled as a whole or by facility from any computer. Easy way to get a full picture of a facilities radiological operations.

2. *RP permits are effectively implemented in support of the facility.*

The review team concluded a sufficient number and quality of RWPs are available to support facility operations. Field personnel understand the RWPs and conditions of use. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- RWP BOF2017006, allows use of rubber, nitrile, or leather gloves to handle rigging materials. In general, rigging materials can easily wear through rubber or nitrile gloves. Leather should be required. The RWP incorrectly lists a technical work document as “Experiment/Equipment Removal from Reactor Instructions”.
- RWP BOF2017008, allows use of Large Area Wipes (LAW) as a minimum on re-entry. MCP-139 specifies that LAWs may not be used to quantify contamination and are to be used to supplement smears. The MCP also states to record LAW results as “bkg” or “ccpm”. This does not equate to limiting conditions on the RWP. Limiting conditions can only be verified with technical smears. On the re-entry evolution observed, both smears and LAWs were taken, which is the acceptable method.
- During the cask handling evolution, the pre-job briefing given by HPT authorized decontamination. A review of the RWP and procedure found no direction to allow decontamination activities. When questioned after the evolution, the HPT directed the assessor to a statement in the PPE section of the RWP which identifies “reachover” PPE to decontaminate localized contamination, as the authorization to carry out decontamination activities. The procedure needs to be updated to allow decontamination which will sync the procedure with the RWP.

Additionally, during review of this criterion, the review team identified the following noteworthy practice: **RP1-NWP-3**: RWP cue card use

- During the Reactor startup for transient operations, a good practice was identified in the use of the Radiological Work Permit (RWP) Cue Card. This is required to be used on all moderate and high risk RWPs. This is a tool for the workers to use to write down key items from the RWP, such as limits, PPE, dosimetry, etc. It gives them a place for notes and contains a list of good radiological work practices. In the field, they can refer to this.

3. *Adequate procedures, facilities and equipment are available to ensure that RP support and services are adequate for safe facility operation. Radiological instruments and equipment required for support are available and calibrated.*

Interviews and field observations, indicate that sufficient processes, facilities and equipment are available for intended operations. Field reviews of equipment found no deficiencies in required calibrations or periodic checks. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- The Thermo RadEye B20-ER and Canberra iCAM are not on the approved instrument list as indicated by GDE-721, section 2. LWP-15007 does not include direction to update the approved instrument list when a new instrument is accepted.

- ECAR-2590, Air flow study October 2015, indicated changes to ventilation were in progress as well as non-standard conditions due to construction activities and no reactor ventilation was available because instrument was air secured. A LabWay action item was closed using evidence that documented a re-evaluation for startup. ECAR-2590 needs to be updated with this closure evidence until retesting is performed in October 2018. As currently documented, an evaluation still needs to be done.

- ECAR-2590 lists set points and placement of Radiation Area Monitor (RAM) units, but no basis for selection of locations and set points. While the basis for RAMs in ECAR-2590 states that the recommendation is to keep the RAMs and lists locations, the necessity and locations are not analyzed based on worker locations, evolutions that may cause unexpected increases in dose rates, or line of sight to those locations. Additionally, alarm set points are merely stated and not calculated based on worker location, expected transients, and detector locations. The purpose of RAMs is to give workers early notice of dose rate changes so that they may limit their doses. See LRD-15001, article 553.1.

- During observation of performance checks of the Thermo Scientific iPCM-12, it was observed that the HPT used a check source that was approximately 100,000 dpm. TPR-6366, section 3.3.1, stipulates a check source "*with at least 5,000 dpm*". While this meets the letter of the procedure there is a note in that section that says *"To ensure the instrument continues to meet performance requirements, sources selected for response checks should have activities as close to the levels stated below as practical, unless using a higher activity source to check multiple detectors at the same time."*. The HPT was checking one detector at a time. The note is consistent with ANSI standards and the manufacturer's technical manual. The idea is to have a source close to the alarm set point to verify the instrument will alarm close to set point.

- TEV-2518, Rev. 0, section 8.2, allows use of most any source to alarm check the PCM. However, if replacement sources are procured, the specifications are very precise. It can't be both ways. If there are such precise specifications on replacement sources, why are these specifications not being used currently?

Additionally, during review of this criterion, the review team identified the following finding:

RP1-POST-1: Contrary to 10 C.F.R. § 835.401(b)(2), the Canberra iCam air monitoring Continuous Air Monitors (CAM) are not capable of measuring energies of radiation expected.

- ECAR-2590 specifies detection of daughter Rubidium (Rb) and Cesium (Cs) radionuclides as being key to airborne radioactivity measurements. These radionuclides have average energies many times that of the Strontium –Yttrium 90 ($Sr\text{-}Y^{90}$) the iCAM unit's alarms are set for and Chlorine-36 (Cl-36) the units are calibrated with. The design of a Passivated Implanted Planar Silicon (PIPS) detector has a key attribute of a thin depletion region between 100 and 1000 micrometers (um). Maximum energy for this thickness is 530 Kilo Electron Volts (keV) which is too low for the Rb/Cs daughters being monitored. The effect is a significantly lower efficiency for Rb/Cs daughters than as anticipated, which is not conservative. Traditional detectors have a better efficiency as energy of monitored radiation increases, but this is not the case with solid state detectors as in the iCAM. Selecting the lowest or a conservative Derived Air Concentration (DAC) value is not conservative if the instrumentation is not capable of accurately measuring the radionuclides of interest. This is why other reactors such as Advanced Test Reactor (ATR) utilize fission gas detection systems. See LRD-15001, articles 551.2.b, 532.4/10CFR835.401(b)(3).

Radionuclide	Average Beta Energy (kev)
Sr-90	196
Cl-36	251
Cs-137	170
Co-60	96
Rb (FG Daughters)	2072/1015/1963
Cs (FG Daughters)	1218/1656

  Based on the above, the actual significance of any dose that may be received by workers, re-entering the facility based on non-conservative data, is minimal. The associated DAC values are very high as compared to traditional fission products such as Cs-137, SrY-90, and any alpha emitters, which would be detected by the iCAMs.

4. *Sufficient qualified personnel are available to effectively implement the RP program in support of the facility. The level of knowledge of managers and staff responsible for implementing the RP program is adequate based on review of records, interviews, and observation of routine evolutions, performance demonstrations, tabletop exercises, and operational and emergency drills.*

The TREAT facility is staffed with sufficient personnel to carry out radiological operations based on a review of the organizational chart and tasks that need to be performed. The level of knowledge and skills of personnel is satisfactory to operate the facility. A review of HPT and supervisor training found all HPTs and the supervisor are qualified to perform duties. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- On-The-Job (OJT) qualification card, AFTF0HPT, Task HPTE04 is for equipment that is no longer used in the facility. The qualification card should to be updated to address the Canberra iCAM.
- OJT qualification card, AFTF0HPT, does not contain all the major tasks performed in the facility. Only knowledge training and evaluation is performed on cask operations. No training or evaluation of the knowledge or skills relating to routine surveys is performed. The task analysis should be updated to reflect major radiological operations of the facility.

- No OJT student guide exists for the TREAT HPT facility qualification. While this is not required, it is a good opportunity for management to state expectations for facility operations and expected coverage actions.
- Roughly 50% of surveys provided for review, and were approved by HPTs, were not reviewed and approved by a supervisor or manager as required by LRD-15001, article 713.1.e. MCP-139, 4.15, allows for a designated alternate. Discussions with the Balance of Facilities (BOF) rad management identified that the Tech 5 position description allows this practice. The Tech 5 classification position roles provides "Providing first-line leadership to the BOF…". However, PDD-1073, 3.3.11.4, specifies that a person assigned to fill a Radiological Control Supervisor (RCS) position temporarily, must be evaluated against those requirements and possess the QNRCSUP1 qualification, which none of the HPT Tech 5s do.

Based on review of radiological technical documents and an interview with the facility Health Physicist (HP), a concern was noted with transfer of knowledge (succession planning). While replacement with another health physicist can be accomplished, the lack of written analysis of retrieved historical technical information would put the project at risk. The current health physicist has 43 years of experience including operation of TREAT. Without that documentation, a new HP would may not understand the basis for monitoring and decisions that have been made.

5. *RP personnel have demonstrated proficiency for normal, abnormal, and emergency operations and have demonstrated acceptable abnormal and emergency event response during routine evolutions, performance demonstrations, tabletop exercises, and operational and emergency drills.*

Observations of job-coverage, routine evolutions and abnormal/emergency event response were performed. The HPTs were proficient in all areas. These items were identified during the review and should be evaluated for inclusion in the issues management system or otherwise resolved:

- FMT1 members did not survey hands before or after handling or taking samples.
- No envelope or bag was available to place air sample in after sampling. Sample was placed in clean glove.
- Personnel assigned to remove affected employees from bus, were not wearing PPE and could have become part of the problem if they become contaminated.
- Facility exercise Evaluator/Controller team did not know how the iCAMs would work in the presence of background radiation. The CAMs are minimally sensitive to background radiation based on the design of the instrument.
- Bus driver was wearing no minimal PPE. He could become part of the problem if he became contaminated when transporting contaminated or potentially contaminated personnel.
- No hot line was established at MFC-721 to clearly delineate clean from possibly not clean. For all intents and purposes, this is the control point.
- No markings to identify 400 meters from facility for FMT1 monitoring.
- Vehicle used for FMT1 response (Kubota) was inadequate for weather conditions.
- No supplemental HPTs sent to support bus offload, surveys, hot line monitoring, etc. TREAT HPTs were involved in the event and could have been part of the problem.

Observations from operations abnormal drill are captured in EP1.

CONCLUSION

This objective was met. During the review, one Post-Start Finding, one deficiency, and three noteworthy practices were identified. The TREAT Radiological Control program effectively implements the INL Radiological Control program. Management, technical staff, and HPTs understand the operation of the facility and processes. Safety is integrated into radiological operations at all levels.

FINDINGS

Pre-Start – None

Post-Start

RP1-POST-1: Contrary to 10 C.F.R. § 835.401(b)(2), the Canberra iCAM air monitoring CAMS are not capable of measuring energies of radiation expected.

DEFICIENCIES:

RP1-DEF-1: Contrary to LWP-15006, Californium 252 sources stored in the TREAT facility are not entered in the INL Radioactive Source Control program.

NOTEWORTHY PRACTICES:

RP1-NWP-1: Use of scrub clothing with mesh pockets to contain hanging items

RP1-NWP-2: Use of electronic radiological logkeeping

RP1-NWP-3: RWP cue card use

Assessed by:	Jerry Kurtz	**Approved by**:	Frank McCoy
	CRA Team Member		**CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Safety Basis

Functional Area:	Objective: SB1	OBJECTIVE MET	
Safety Basis	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

SB1: Facility safety documentation (normally SAR and TS) is in place that describes the "safety envelope" of the facility.

CRITERIA

1. The safety documentation characterizes the hazards/risks associated with the facility and identifies preventive and mitigating measures (systems, procedures, administrative controls, etc.) that protect workers and the public from those hazards/risks.
2. Facility Safety Documentation is developed and approved by DOE with an associated Safety Evaluation Report (SER), available to facility personnel, and implemented through reactor operation implementing procedures. Conditions of Approval from the DOE SER, if identified, are also implemented in reactor operation implementing procedures. Implementation of facility safety documentation has been verified and is current.
3. Procedures for maintaining the safety documentation have been adequately defined and implemented and provide for required updates.
4. A DOE-approved USQ procedure has been effectively implemented for all facility changes that have occurred since initial approval of the final SAR.
5. A Core Physics Analysis (CPA) and Operations Test Plan (OTP) has been developed and approved for initial reactor startup and operation. The CPA conforms to site procedures. The OTP conforms to site procedures, SAR-420 and TS-420.
6. An Experiment Safety Analysis (ESA) has been developed and approved for the first projected experiment. The ESA conforms to site procedures, SAR-420 and TS-420.
7. Sufficient qualified personnel are available to effectively implement the nuclear safety program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the nuclear safety program is adequate based on review of records, interview results, and observation of performance.
8. Prerequisites PR-6.1, PR-6.2 and PR-6.4 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review nuclear safety program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420.

Review the Core Physics Analysis (CPA) and Operations Test Plan (OTP) for initial reactor startup and operation.

Review the ESA for the first projected experiment.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the safety basis related role and responsibility interfaces with TREAT facility operations.

Review the DOE Safety Evaluation Report (SER) and associated conditions of Approval, and DOE approval documentation.

Review documentation that establishes traceability of safety basis requirements to implementing procedures.

Review documentation that verified TS implementation

Review the USQ procedure and associated DOE approval documentation.

Review a representative sampling of documents and records that validate the implementation of nuclear safety at the TREAT facility. These include:

- Management and independent assessment of safety basis implementation at the TREAT facility and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the "health" of safety basis implementation at the TREAT facility; including conclusions and assigned actions by senior management.
- MSA documentation associated with safety basis implementation at the TREAT facility.
- Status and documentation of all open and recently closed specific safety basis issues, corrective actions, and Lesson Learned at the TREAT facility.
- Staffing plans for safety basis support at the TREAT facility.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing nuclear safety activities at the TREAT facility.
- Documentation demonstrating flow down of SAR/TS controls into operating procedures.
- A select sample of procedures that implement nuclear safety requirements and controls.
- Safety Basis document list.
- Procedures associated with nuclear safety activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed or in-progress output documentation associated with safety basis activities at the TREAT facility to evaluate the adequacy and completeness of the activities to include PISAs.

Interview the nuclear safety program manager and select subject matter experts (SMEs) to ascertain:

- How the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures.
- How SAR/TS requirements and controls were flowed to procedures and how BEA confirmed that procedures completely and accurately implemented those requirements through the implementation process via the MSA.

Interview selected personnel who are involved in performing, supervising, and reviewing nuclear safety activities to confirm their level of knowledge and understanding of nuclear safety related controls and requirements and their implementation and confirm their role and responsibility interfaces with the operations organization. Personnel interviewed will include: the Nuclear and Criticality Safety Manager, Nuclear Safety Engineers, Cognizant System Engineers, Facility Manager, Shift Supervisors and Reactor Operators.

Interview Reactor Engineering and Experiment Safety Engineering personnel regarding development of the CPA, OTP, and ESA.

Observe nuclear safety related meetings, pre job briefings and work in the field to validate nuclear safety activities are being conducted safely and in a manner that will support and sustain operations. Confirm sufficient nuclear safety and staffing and equipment are available to support operations. Confirm procedures and work documents are adequate in content, level of detail, acceptance criteria, and properly implement nuclear safety requirements. Confirm that the knowledge of workers and supervisors who implement nuclear safety controls is adequate.

Reviewers: Anne McCartin

Records Reviewed

- CTR-396, Rev. 5, "TREAT Facility Safety Operations Review Committee," April 17, 2017.
- CTR-399, Rev. 4, "TREAT Operations Review Committee," March 30, 2017.
- ECAR-1471, Rev. 0, "Results of TREAT Physics Safety Analysis for Restart Operation with Core Loading," March 16, 2017.
- ECR 648065 to TREAT-ESA-001.
- ECR 648929 to TREAT-OTP-17-001.
- ECR 649244 to TREAT-ESA-001.
- FRM-411, "INL Nuclear Facility Standard Safety Basis Implementation Checklist for Transient Reactor Test (TREAT) Facility SAR-420 and TS-420 for Reactor SHUTDOWN Mode," and associated FRM-422, 'Implementation Matrix and Plan (IMP) for Reactor SHUTDOWN Mode,'" October 2016.
- FRM-411, "INL Nuclear Facility Standard Safety Basis Implementation Checklist for Transient Reactor Test (TREAT) Facility SAR-420 and TS-420 for Reactor STARTUP, STEADY STATE and TRANSIENT Modes of Operation," and associated FRM-422, 'Implementation Matrix and Plan (IMP) for Reactor STARTUP, STEADY STATE and TRANSIENT Modes,'" March 2017.
- FRM-1545, Rev. 2, "Shutdown Data Sheet," May 23, 2017.
- FRM-1554, Rev. 4, "Startup Data Sheet," May 24, 2017.
- FRM-1546, Rev. 2, "Heat Balance Data Sheet," March 1, 2017.
- FRM-1547, Rev. 3, "Transient Data Summary Sheet," April 3, 2017.
- FRM-1549, Rev. 3, "Shift Supervisor-Pre-Transient Check Sheet," May 24, 2017.
- FRM-1550, Rev. 2, "Shift Supervisor-Post-Transient Check Sheet," April 3, 2017.
- FRM-1551, Rev. 1, "Meteorological Check Sheet", April 3, 2017.

- FRM-1728, Rev. 4, "Reactivity Shutdown Margin and Excess Reactivity Worksheet," May 23, 2017.
- FRM-1738, Rev. 3, "Transient Reactor Test Facility (TREAT) Fuel Loading Chart," October 11, 2016.
- FRM-1887, Rev. 1, "TREAT Surveillance Check Log," March 30, 2017.
- FRM-2344, Rev. 0, "Daily Core Energy Calculation," March 1, 2017.
- FRM-2345, Rev. 0, "Core Total Energy Log," March 1, 2017.
- GDE-774, Rev. 0, "Performance of TREAT Core Reactor Physics/Thermal Analyses," February 15, 2017.
- GDE-775, Rev. 1, "Preparation of TREAT Operating Test Plans," April 3, 2017.
- IAS Number: 16879, "Implementation of the USQ Process for the TREAT Facility," February 1, 2016.
- LabWay CO 2015-2785.
- LabWay CO 2016-1570.
- LabWay CO 2016-1910.
- LabWay CO 2016-1915.
- LabWay CO 2016-2293.
- LabWay CO 2016-2465.
- LabWay CO 2016-2576.
- LabWay CO 2016-2711.
- LabWay CO 2016-1180.
- LabWay CO 2016-2732.
- LabWay CO 2017-0260.
- LabWay CO 2017-0261.
- LabWay CO 2017-0667.
- Letter, CCN 239096, from J. Bumgardner to R. Boston, Subject; "Resumption of Transient Testing Program – Documentation – Completion of TREAT Implementation of SAR-420 Revision 0 and TS-420 Revision 0," October 11, 2016.
- Letter, CCN 240014, from J. Bumgardner to R. Boston, Subject: "Resumption of Transient Testing Program – Documentation – Completion of TREAT Implementation of SAR-420 Revision 1 and TS-420 Revision 1 for all modes of operation," March 1, 2017.
- Letter, OS-OPAD-NSP-13-006, from R. Boston to W. Landon, Subject: "Department of Energy Approval of LWP-10801, 'INL Unreviewed Safety Questions,' Revision 1," February 4, 2013."
- Letter, OS-OPAD-NSP-15-011, R. Boston letter to K. Beierschmitt, Subject: "Nuclear Energy, Idaho Operations Office Documented Safety Analysis Review and Oversight Information," July 28, 2015.

- Letter, OS-OPAD-NSP-16-026, from R. Boston to J. Bumgardner, Subject: "Department of Energy Approval of the Transient Reactor Test Facility Safety Analysis Report (SAR-420) and Technical Specifications (TS-420)," July 20, 2016, including SER enclosure.
- Letter, OS-OPAD-NSP-17-008, R. Boston letter to J. Bumgardner, Subject: "Department of Energy Approval of the Transient Reactor Test Facility Final Safety Analysis Report (SAR-420) Revision 1 and Technical Specifications (TS-420) Revision 1," February 16, 2017, including SER enclosure.
- LST-992, Rev. 3, "TREAT Nuclear Safety Basis Implementation Matrix," April 13, 2017.
- LWP-10801, Rev. 1, "INL Unreviewed Safety Questions," May 1, 2013.
- LWP-18112, Rev. 0, "INL Facility /Categorization," October 3, 2016.
- MCP-18121, Rev. 0, "Safety Analysis Process," October 6, 2016.
- MCP-18122, Rev. 0, "Implementation of Facility Safety Basis / Potential Inadequacies in the Safety Analysis (PISA) Interim Controls," September 26, 2016.
- Memorandum, from C. Pope to J. Bumgardner, Subject: "TREAT SORC Review of TREAT-OTP-17-001, TREAT Restart," April 11, 2017.
- Memorandum, from J. Biggs to D. Broussard, Subject: "PLN-5146, Contractor Readiness Assessment (RA) Plan of Action for the TREAT Restart of Transient Testing Activity," May 25, 2017.
- Memorandum, from A. Laporta to J. Biggs, Subject: "Revised Shutdown Margin Letter for the TREAT Core Load 1470 Mock Operations and Maintenance." October 5, 2016.
- MFC-USQ-2016-769, "WO 228788 Install Jumper on Transient Rod Drive Skid, SAR-420 & TS-420."
- MFC-USQ-2016-868, "Create SD-49.4.12, TREAT Shutdown Margin Calculation and Associated Core Changes, eCR 642909."
- MFC-USQ-2016-1020, "TREAT Control Room (724) Chart Recorder Rewiring (EJ 23-0001/1843)."
- MFC-USQ-2016-1065, "Reduction in TREAT Exclusion Zone."
- MFC-USQ-2016-1082, "EJ No. 5-0002/2187-1, 'Add Scram Air Instrumentation Calibration Quick Connects.'"
- MFC-USQ-2016-1173, EJ 6-0001/2214-1, "Modify Sensor Targets for Control/Shutdown Rod Down Indication."
- MFC-USQ-2017-054, "Revise SD-49.4.12 "TREAT Shutdown Margin Calculation and Associated Core Changes eCR 647210."
- MFC-USQ-2017-302, "Revise TREAT-OI-0301 (eCR 648896), TREAT-OI-0304 (eCR 648899), and TREAT-OI-0708 (eCR 648894)."
- MFC-USQ-2017-320, "Revise TREAT-OI-0302 (eCR 648942), TREAT-OI-0503 (eCR 648506), TREAT-OI-0504 (eCR 648480), TREAT-OI-0507 (eCR 648459), TREAT-OI-0511 (eCR 648585), TREAT-OI-0704 (eCR 648903) and TREAT-OI-1015 (eCR 648942)."
- MFC-USQ-2017-352, "Revision to TREAT-OI-0102 (eCR 649189) and TREAT-OI-0103 (eCR 649189)."

- MFC-USQ-2017-358, “TREAT-OTP-17-001, "TREAT Operating Test Plan - TREAT Startup" (eCR 648929).”
- MFC-USQ-2017-375, “TREAT-OI-0304 Fuel Handling Cask Operations (eCR 649586).”
- MFC-USQ-2017-491, “Revise TREAT-OI-0705 TREAT Air Systems (eCR 650253).”
- MFC-USQ-2017-501, “Revise TREAT-OI-0507 Transient Operations (eCR 650333).”
- MF-USQ-2017-520, “Revise TREAT-OI-0704, "Reactor Building 15-Ton and 20/10-Ton High-Bay Bridge Crane", per eCR 650329.”
- MWO 229922, “TREAT-720 - RTS Transient Linear Channel Calibration.”
- MWO 229923, “TREAT-720 - RTS Transient Energy Channel Calibration.”
- MWO 229924, “TREAT-720 RTS Transient Log/Period Channel Calibration.”
- MWO 229925, “TREAT-720 RTS Steady-State Linear Channel Calibration.”
- MWO 229927, “TREAT-720 - RTS Steady-State Log/Period Calibration.”
- MWO 229928, “TREAT-720 - RTS Transient Input Trip Logic Calibration.”
- MWO 229929, “TREAT-720 - RTS Steady-State Input Trip Logic Calibration.”
- MWO 229931, “TREAT-720 - RTS Output Trip Logic Calibration.”
- MWO 229932, “TREAT-720 - N2 Pressure Switch Calibration.”
- MWO 229933, “TREAT-720 - RTS Pressure Switch Channel Calibration.”
- MWO 229934, “TREAT-720 - RTS Seismic Channel Calibration.”
- MWO 229935, “TREAT-720 - RTS Fuel Temp Channel Calibration.”
- PLN-4029, Rev. 11, “INL Nuclear Facility and INL Transportation Safety Basis Annual Update Schedule”, April 10, 2017.
- SAR-420, Rev. 1, “Transient Reactor Test (TREAT) Facility FSAR,” March 1, 2017.
- SD-49.5.0, Rev. 0, “TREAT Experiment Safety Engineering Roles and Responsibilities Statement,” March 23, 2017.
- SDD-49.4.5, Rev. 2, “TREAT Facility Engineering Roles and Responsibility Statement,” October 11, 2016.
- SP-50.3.3.0, Rev. 1, “TREAT Safety-basis Implementation Roles and Responsibilities,” November 5, 2015.
- SP-50.3.4.1, Rev. 1, “TREAT Experiment Safety Analysis Preparation and Approval,” April 10, 2017.
- SP-50.3.4.2, Rev. 1, “TREAT Physics and Operations Test Plan Preparation and Approval,” April 10, 2017.
- TEV-2221, Rev. 0, “Hazard Categorization for the TREAT Core Load 1469,” October 7, 2014.
- TFR-945, Rev. 1, “The Multi-SERTTA Irradiation Vehicle for TREAT,” March 24, 2017.
- TREAT Organizational Charts

- TREAT-ESA-001, Rev. 1, "Experiments Operated in Multi-SERTTA in a Water Environment," April 10, 2017.
- TREAT-OI-0301, Rev. 10, "TREAT Fuel/Dummy/Poison Movement and Evaluation," May 31, 2017.
- TREAT-OI-0502, Rev. 4, "Automatic Reactor Control System Instructions," May 30, 2017.
- TREAT OI 0503, Rev. 9, "Control Rod Movement While Shutdown," May 30, 2017.
- TREAT-OI-0504, Rev. 2, "Reactor Operations," May 31, 2017.
- TREAT-OI-0505, Rev. 2, "Heat Balance," May 3, 2017.
- TREAT-OI-0507, Rev. 3, "Transient Operations," May 23, 2017.
- TREAT-OI-0508, Rev. 2, "Control Rod Scram Test Instructions," May 31, 2017.
- TREAT-OI-0509, Rev. 2, "Dedicated Microprocessor Tester Operations," May 30, 2017.
- TREAT-OI-0510, Rev. 2, "Core Characterization," May 31, 2017.
- TREAT-OTP-0511, Rev. 2, "Rod Worth Determination," May 30, 2017.
- TREAT-OTP-17-001, Rev. 1, "TREAT Restart," April 13, 2017.
- TS-420, Rev. 1, "Technical Specifications for the TREAT Facility," March 1, 2017.

Interviews Conducted

- INL Nuclear Safety Program Lead and SME
- TREAT Cognizant System Engineer
- TREAT Safety Analyst
- TREAT Reactor Engineers (including lead)
- TREAT Experiment Safety Engineering Manager
- TREAT Engineering Manager
- TREAT Experiment Engineer (ESA Author)
- TREAT Implementation Coordinator and Deputy Operations Manager
- TREAT Operations Manager
- TREAT Shift Supervisors
- TREAT Reactor Operator
- TREAT Transient Control Specialists
- TREAT Training Instructor
- TREAT SORC Chairman

Evolutions/Operations Witnessed

- Reactor Startup and Transient Evolution Demonstration
- Heat Balance Demonstration

- Rod Worth Demonstration

DISCUSSION OF RESULTS

1. *The safety documentation characterizes the hazards/risks associated with the facility and identifies preventive and mitigating measures (systems, procedures, administrative controls, etc.) that protect workers and the public from those hazards/risks.*

The CRA team concludes that the safety documentation characterizes the hazards/risks associated with the facility and identifies preventive and mitigating measures that protect workers and the public from those hazards/risks.

The submittal of the TREAT SAR and TS was in compliance with 10 CFR 830, Subpart B, NRC RG 1.70, and the DOE Review and Oversight Information (OS-OPAD-NSP-15-011), and the subsequent approval by DOE through the issuance of the SERs for Revision 0 (OS-OPAD-NSP-16-026) and Revision 1 (OS-OPAD-NSP-17-008), demonstrates that approved facility safety documentation is available.

The SAR-420 hazard and accident analysis includes a qualitative hazard analysis to identify potential hazardous events that could result in an uncontrolled release of radioactive material and affect the facility and co-located workers, public, or the environment. From the hazards analysis, limiting events were selected for further analysis. The accidents were analyzed for radiological dose consequences and were found to be well within the applicable Evaluation Guideline limits. TS safety limits, limiting control settings and limiting conditions for operation are not required for protection of the facility and co-located workers, public, or the environment. However, to align the TREAT facility to precedent with other test/research reactors licensed by NRC or operated by DOE, a TS safety limit and limiting control setting on fuel temperature are established. SSCs are categorized as safety-related, non-safety-related with augmented requirements, and non-safety-related consistent with ANSI/ANS-58.14-2001, *Safety and Pressure Integrity Classification Criteria for Light Water Reactors*. Active safety SSCs and engineered safety features are not required for protection of the facility and co-located workers, public, or the environment for transient operations and analyzed accidents. However, some SSCs are designated as safety-related due to their importance and to ensure containment of the radiological source term and the capability to shut down the reactor and maintain it in a safety shutdown condition.

2. *Facility Safety Documentation is developed and approved by DOE with an associated Safety Evaluation Report (SER), available to facility personnel, and implemented through reactor operation implementing procedures. Conditions of Approval from the DOE SER, if identified, are also implemented in reactor operation implementing procedures. Implementation of facility safety documentation has been verified and is current.*

The CRA team concludes that the facility safety documentation has been approved by DOE with a SER, has been implemented through reactor operation implementing procedures, and that the implementation is current.

DOE issued the SER approving Revision 0 of SAR-420 and TS-420 on July 20, 2016 (OS-OPAD-NSP-16-026) and the SER approving Revision 1 on February 16, 2017 (OS-OPAD-NSP-17-008).

The SER for revision 0 of the SAR and TS identified the following 4 COAs:

1. The minimum shutdown margin specified by LCO 3.2.3 shall be maintained by the 16 poison assemblies installed in the core to allow mock operations for equipment testing, operator training procedure validation, and restart activities. This COA is cancelled following successful completion of the DOE Readiness Assessment for TREAT and the Start-up Authority providing written approval to start TREAT operations.

2. Remove the following paragraph from TS Section 2, Safety Limits,: “Based on the accident analysis results from SAR-420 Chapter 15, per ANSI/ANS 15.1, 2.1.3(1), no TREAT SLs are derived for protection of the offsite public. However, to align TREAT with industry precedent for other test/research reactors operated by the DOE, per ANSI/ANS 15.1, 2.1.3(2), the following SL is established:”
3. Remove the following paragraph from TS Section 3/4, Operating Limits and Surveillance Requirements: “Based on the accident analysis results from SAR-420 Chapter 15, per this criterion, no LCSs are required. However, to align TREAT with industry precedent for other test/research reactors operated by the DOE, per ANSI/ANS 15.1, 2.2, an LCS was established.”
4. Revise TS AC 5.8.3 to read:

   AC 5.8.3 A CONTRACTOR-designated independent review committee shall review, as a minimum, the following:

   a. Potential inadequacy in the safety analysis (PISA) USQ determinations.
   b. Potential inadequacy in the safety analysis (PISA) reasonability determinations.
   c. Changes to the safety basis.
   d. Experiment safety analysis (ESA).
   e. Other items as requested by TREAT facility management.

   The membership, responsibilities, and procedures of the review committee shall be formally documented and approved by the contractor.

The SER for revision 1 of the SAR and TS stated that 3 of the 4 COAs (COAs 2, 3, and 4) have been implemented by the contractor and are superseded. COA 1 remains active, and one new COA was identified as follows:

1. Revise SAR-420, Chapter 10, Table 10-4, ESA, third bullet to read “A separate hazard analysis shall be required to support experiment support operations in the reactor building.”

A review of TS-420 Revision 1 confirmed that COAs 2, 3, and 4 from the Revision 0 SER have been incorporated into the TS. A review of SAR-420 Revision 1 confirmed that the additional COA from the Revision 1 SER was incorporated into Revision 1 of the SAR upon publication/implementation.

During the TREAT safety basis development and readiness activities, INL procedures that govern nuclear safety analysis related work were renumbered to reflect transfer to a separate laboratory-wide manual. Interview with the INL Nuclear Safety subject matter expert confirmed that although the procedure numbering was changed, the process steps and requirements remain unchanged. The following discussion will reference both the current and superseded document identifiers.

MCP-18121 (previously LWP-10803) describes the INL safety analysis process used for the TREAT SAR and TS preparation. MCP-18121 requires new and revised safety bases to be implemented in accordance with MCP-18122 (previously LWP-9904).

MCP-18122 directs the Nuclear Facility Manager to implement the facility safety basis in accordance with FRM-411 and FRM-422 and cites SP-50.3.3.0 as the TREAT-specific implementation procedure. MCP-18122 requires COAs to be tracked and managed until closed and requires COAs to be identified on the facility safety basis implementation matrix. SP-50.3.3.0 defines the responsibilities of the implementation coordinator, nuclear safety engineering, and document management organizations during the implementation process at TREAT.

Implementation of the TREAT safety basis was completed in accordance with the INL procedures. Review of the FRM-411 and FRM-422 for the Revision 0 and Revision 1 implementations demonstrated completion of the activities required for implementation, and letters CCN 239096 and CCN 240014 provided DOE notification that the implementations were complete. As identified in the MSA, the EDMS-controlled FRM-422 was not used; however, an Excel spreadsheet emulating the FRM-422 was created. The EDMS-controlled form is a series of tables in a Word document that allows the user to input information and to add and delete rows as needed. The spreadsheet format used at TREAT contains the same table formatting and information as the EDMS-controlled Word form, but allows for easier sorting, formatting, and filtering. Use of the Excel version of the form is not considered contrary to the INL implementation process.

Items identified as follow on actions were reviewed in the INL Issues Management System, LabWay, to verify status. On issue related to fire protection, CO 2016-1570, remains open. In addition, two individuals have not completed the required safety basis implementation training. Status of their training is continuing to be tracked in LabWay. All other follow on actions are reported as complete.

LST-992 provides a matrix of SAR and TS requirements and their implementing documents. As required by MCP-18122, LST-992 identifies the COAs and their associated implementation.

The review of the items discussed above confirms that adequate documentation exists to demonstrate the safety basis is fully implemented.

A select sample of operations procedures, forms, and maintenance work orders were reviewed to evaluate the implementation process at TREAT. The documents reviewed were then compared to the implementation matrix provided in LST-992. The review revealed that the safety basis requirements are being adequately implemented in the facility procedures and that the implementation is being maintained current with the safety basis requirements. It was identified that as the operations procedures continue to develop and evolve, that changes to the implementation matrix provided in LST-992 to reflect the procedures changes have not occurred simultaneously and have lagged behind. However, that is not unexpected in such a dynamic environment, and company-wide procedures that prescribe the use of a safety basis implementation matrix provide no instruction for maintenance or revision outside of the implementation process that occurs with a safety basis revision. Therefore, discrepancies in LST-992 due to procedure revisions that have occurred since the last safety basis implementation are not considered an indication that the safety basis implementation is not being maintained current. In addition, because all of the identified discrepancies had already been identified by TREAT and were included in a pending revision to the list, they will not be repeated herein.

The following issues were identified during the document review:

- FRM-1549 completes actions required to meet AC 5.10.1.3 and should be marked as TS related.
- Procedures, such as TREAT-OI-0507, that utilize information from the OTP should be reviewed to determine if they should include steps to record the OTP number.
- TREAT-OI-0507 should consistently communicate mode changes.
- TREAT-OI-0507, Step 5.7.3, should be revised to eliminate use of the word “mode” to describe transient extended operations to prevent confusion with TS-defined modes of operation.
- TREAT-OI-0507 is missing . FRM-1738 in the list of references.
- AC 5.10.1.7 is not consistently implemented in the various operating procedures.
- TREAT-OI-0505 Steps 5.4 and 5.5 are out of sequence, since FRM-1546 verifies completion of the functional test surveillance.

BEA should evaluate these issues for inclusion in their issues management system or otherwise resolve these issues.

In addition to the items noted above, the review of the safety basis documentation identified that TS-420 requires SORC review of PISA reasonability determinations. Per LWP-10801, Table 2, ISRC/SORC approval is only required on PISA RDs when existence of a PISA is determined to be reasonable. CTR-396 echoes the TS wording and gives no additional instruction. SAR-420, Section 13.4, states that the SORC is responsible for oversight and review of USQ determinations and potential inadequacy in the safety analysis reasonability determinations as required by LWP-10801. Because the TS does not include either of the "as required by LWP-10801" or "when existence of a PISA is determined to be reasonable" clarifiers, it is unclear if the TS is intending to match the LWP requirement or if it is applying an additional requirement above the lab-wide process to review USQ RD even if the determination that a PISA exists is not reasonable. TREAT should provide additional instruction beyond LWP-10801 to ensure all PISA RDs are reviewed by SORC until the clarification is made in the TSs.

3. *Procedures for maintaining the safety documentation have been adequately defined and implemented and provide for required updates.*

The CRA team concludes that procedures for maintaining the safety documentation have been adequately defined and implemented and provide for required updates.

As discussed in Criterion 2, during the TREAT safety basis development and readiness activities, INL procedures that govern nuclear safety analysis related work were renumbered to reflect transfer to a separate laboratory-wide manual. Interview with the INL Nuclear Safety subject matter expert confirmed that although the procedure numbering was changed, the process steps and requirements remain unchanged. The following discussion will reference both the current and superseded document identifiers.

MCP-18121 (previously LWP-10803) describes the INL safety analysis process for Hazard Category 1, 2, and 3 nuclear facilities. LWP-18112 (formerly LWP-10802) describes the INL process for facility hazard categorization. TEV-2221 documents that TREAT is a Hazard Category 2 nuclear facility.

MCP-18121 identifies NRC RG 1.70 as a methodology currently used at INL and NUREG-0800 as guidance applicable to the safety basis methodology being used. SAR-420 and TS-420 were developed using RG 1.70 and NUREG-0800, with additional guidance from Brookhaven National Laboratory (BNL) 50831-V, *Design Guide for Category V Reactors, Transient Reactors* and BNL 50831-VI, "Design Guide for Category VI Reactors, Air Cooled Graphite Reactors."

MCP-18121 requires safety basis documents to be updated in accordance with PLN-4029, which identifies that the TREAT SAR/TS-420 annual update shall be submitted in January of each year. OS-OPAD-NSP-17-008 for revision 1 of the safety basis indicated that the revision was the 2017 annual update of the facility safety basis, and that it was submitted to DOE for approval in January in accordance with PLN-4029.

MCP-18121 also requires new and revised safety bases to be implemented in accordance with MCP-18122 (previously LWP-9904). MCP-18122 directs the Nuclear Facility Manager to implement the facility safety basis in accordance with FRM-411 and FRM-422 and cites SP-50.3.3.0 as the TREAT-specific implementation procedure. As discussed in Criterion 2, implementation of the TREAT safety basis was completed in accordance with the INL procedures.

Last, LWP-10801 establishes the process and expectations for implementing the unreviewed safety question process. Use of the process will be discussed further in Criterion 4.

INL safety analysis procedures are well established and have been utilized for TREAT. The procedures reviewed are adequate to implement and maintain the safety basis and provide for the required updates.

4. *A DOE-approved USQ procedure has been effectively implemented for all facility changes that have occurred since initial approval of the final SAR.*

The CRA team concludes that a DOE-approved USQ procedure has been effectively implemented for all facility changes that have occurred since initial approval of the final SAR.

TS-420 AC 5.7.9 requires a contractor program that shall be implemented and maintained for the control of USQs, based on the requirements of 10 CFR 830 Subpart B. TREAT implements the INL unreviewed safety question program described in LWP-10801. LWP-10801, "INL Unreviewed Safety Question," Revision 1, was approved by DOE on February 4, 2013. The implementation for facility changes that have occurred since initial approval of SAR-420 and TS-420 is currently ongoing.

A select sample of USQ evaluations were reviewed for proposed changed involving procedure revisions, the OTP, and facility modifications. The review included USQ screens, determinations, and bounding USQ reviews. No PISA reasonability determinations have been written since the initial approval of SAR-420 and TS-420, so none were included in the review.

The following items were found during the review of USQ evaluations:

- one USQ screen (MFC-USQ-2016-769) did not adequately justify the answers to all of the screening questions
- two USQ determinations (MFC-USQ-2017-203 and MFC-USQ-2017-320) did not provide sufficient information in the proposed change description to support the screening and determination answers, and both answered "yes" to screening questions in a manner that may have justified a "no " answer
- three bounding USQ reviews (MFC-USQ-2017-501, MFC-USQ-2017-375, and MFC-USQ-2017-054) incorrectly applied the bounding criteria allowed per LWP-10801 in that they justified the bounding conclusion based on the impact of the Proposed Change and not the scope of the new Proposed Change being within the scope of the original Proposed Change.

The USQ evaluations cited above concluded that DOE approval was not required, and the items identified during the review did not create errors in those conclusions. The review concludes that the TREAT personnel are properly trained and qualified and that they are knowledgeable of the process. It is also observed that USQ evaluations are performed when required and the USQ process is effectively implemented.

5. *A Core Physics Analysis (CPA) and Operations Test Plan (OTP) has been developed and approved for initial reactor startup and operation. The CPA conforms to site procedures. The OTP conforms to site procedures, SAR-420 and TS-420.*

The CRA team concludes that a Core Physics Analysis (CPA) and Operations Test Plan (OTP) has been developed and approved for initial reactor startup and operation and that the CPA conforms for site procedures and that the OTP conforms to site procedures, SAR-420, and TS-420.

The following documents were reviewed to evaluate this criterion:

- SP-50.3.4.2, Rev. 1, "TREAT Physics and Operations Test Plan Preparation and Approval," April 10, 2017.
- TREAT-OTP-17-001, Rev. 1, "TREAT Restart," April 13, 2017.
- ECAR-1471, Rev. 0, "Results of TREAT Physics Safety Analysis for Restart Operation with Core Loading," March 16, 2017.

- GDE-774, Rev. 0, "Performance of TREAT Core Reactor Physics/Thermal Analyses," February 15, 2017.
- GDE-775, Rev. 1, "Preparation of TREAT Operating Test Plans," April 3, 2017.
- SDD-49.4.5, Rev. 2, "TREAT Facility Engineering Roles and Responsibility Statement," October 11, 2016.

A review of the SAR and TS OTP requirements was performed and evaluated against the implementation matrix provided in LST-992 and SP-50.3.4.2 to evaluate the roll-down of requirements. The review revealed that the safety basis requirements and laboratory requirements for engineering analyses were adequately rolled down into the CPA and OTP process.

6. An Experiment Safety Analysis (ESA) has been developed and approved for the first projected experiment. The ESA conforms to site procedures, SAR-420 and TS-420.

The CRA team concludes that an Experiment Safety Analysis has been developed and approved for the first projected experiment and that the ESA conforms to site procedures, SAR-420, and TS-420.

The following documents were reviewed to evaluate this criterion:

- SAR-420, Rev. 1, "Transient Reactor Test (TREAT) Facility FSAR," March 1, 2017.
- TS-420, Rev. 1, "Technical Specifications for the TREAT Facility," March 1, 2017.
- SP-50.3.4.1, Rev. 1, "TREAT Experiment Safety Analysis Preparation and Approval," April 10, 2017.
- TREAT-ESA-001, Rev. 1, "Experiments Operated in Multi-SERTTA in a Water Environment," April 10, 2017.
- TFR-945, Rev. 1, "The Multi-SERTTA Irradiation Vehicle for TREAT," March 24, 2017.

A review of the SAR and TS ESA requirements was performed and evaluated against the implementation matrix provided in LST-992 and SP-50.3.4.1 to evaluate the roll-down of requirements. The review revealed that the safety basis requirements had been adequately rolled down into the ESA procedures, but noted the following items that should be addressed:

- SP-50.3.4.1 specifies the incorrect document reference for the SORC charter.
- SP-50.3.4.1, Section 1, lists safety analysis commitment 10.3.1 as being implemented in the SP. However, all of the steps in the procedure that cite the commitment are steps for review/approvals and not instruction to perform a hazard analysis or statement that the ESA includes the hazard analysis as required by SAR-420, Table 10-4.
- SP-50.3.4.1 provides inconsistent instructions for how new ESAs and revised ESAs are transmitted to Operations.
- SP-50.3.4.1 Step 4.6.2 directs the ESA author to notify document management if no annual review is required but does not include steps for document owner concurrence or notification.

BEA should evaluate these issues for inclusion in their issues management system or otherwise resolve these issues.

A review of TREAT-ESA-001 was performed to verify its compliance with SP-50.3.4.1 and the safety basis requirements. The review revealed that the safety basis requirements have been adequately evaluated in TREAT-ESA-001, but noted the following items that should be addressed:

- TREAT-ESA-001 does not provide a specific reference or discussion regarding compliance with Safety Analysis Commitment 10.3.1 for the SAR-420, Table 10-4, requirement to perform a hazards analysis.
- TREAT-ESA-001 Table 1 should include the requirement that the experiment does not contain sodium, consistent with the verification checklist.
- TREAT-ESA-001 Table 1 Row 1 (TLHC restriction) should reference Section 5 as the basis for the restriction to avoid confusion with process step descriptions and compliance table locations that describe handling with the TLHC.
- TREAT-ESA-001 Table 1 Row 6 (uranium content) should also identify Compliance 4.
- TREAT-ESA-001 Table 2, Item 1, cites TREAT-OI-0103 for compliance with TS 3.4.3. TREAT-OI-0103 has been superseded by TREAT-OI-0708.
- TREAT-ESA-001 Table 2 Compliance 6 identifies QLDs for the DAS at both a non-safety software and safety software level. This is not consistent with TFR-945 which states that the DAS is non-safety software and the PLC is safety software.
- TREAT-ESA-001 Table 2 Compliance 6 does not include anything that requires verification of the software QA requirements.
- TREAT-ESA-001 Table 2 Compliance items 6 and 13 state that a green tag will be supplied with the experiment. The process does not include anything that requires verification that the tags are included.
- TREAT-ESA-001 – Section 3.2, Step 12, describes steps for preparing the experiment loop for shipment after irradiation in the TREAT facility, but identifies pre-irradiation experiment handling accidents (EH-2 and EH-4) as the applicable accidents.

BEA should evaluate these issues for inclusion in their issues management system or otherwise resolve these issues.

TREAT-ESA-001, Table 1, summarizes the experiment safety analysis commitments that are derived as part of the evaluation. The use of the summary and the reference to the ESA section that derives the commitment is identified as a Noteworthy Practice to facilitate communication of the commitments derived and the location of their Bases.

7. *Sufficient qualified personnel are available to effectively implement the nuclear safety program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the nuclear safety program is adequate based on review of records, interview results, and observation of performance during field performance demonstrations, tabletop exercises, and operational and emergency drills. This includes knowledge of project activities and safety basis requirements commensurate with their responsibilities.*

The CRA team concludes that sufficient qualified personnel are available to effectively implement the nuclear safety program in support of the facility and that the level of knowledge for all staff members is adequate to administer and implement the nuclear safety program.

TRAIN was reviewed to determine the status and numbers of trained individuals with responsibility for TREAT safety basis (including ESA and OTP) preparation, safety basis implementation, and USQ process activities. Because of the small staff at TREAT, only a minimum number of qualified employees are available for some roles. While this could pose a challenge to meeting facility mission needs in the future, it is currently not a deficiency with respect to compliance to nuclear safety procedures and the

ability to maintain the nuclear safety program. Nuclear Safety personnel were interviewed and stated that there were adequate resources going forward to implement and maintain the nuclear safety program.

Review of INL's issues management program identified some individuals that have not completed the required safety basis training to support implementation. However, completion of the training is continuing to be tracked and does not impact the program's ability to meet nuclear safety objectives.

Interviews evaluated the employees' knowledge and understanding of the USQ, safety basis, ESA and OTP preparation, implementation, requirements and compliance. Interviews and observations of work performed demonstrate that the employees maintain the necessary knowledge and understanding of those subjects.

Two items were noted during the review with respect to training and qualifications. The first was identified during the review of SP-50.3.4.1. SP-50.3.4.1 requires either a TREAT Experiment Engineer qualified individual or an INL Safety Analyst qualified individual to author ESAs. The TREAT-ESA-001 author has significant experience authoring experiment safety analyses at another DOE reactor facility; however, it was not clear that the TREAT Experiment Engineer qualification alone provides adequate training to enable the author to perform a hazards analysis. This issue is discussed in TQ1. The second item was identified during review of the OTP development. The review identified that SP-49.4.5 does not include roles and responsibilities for reactor engineers.

BEA should evaluate these issues for inclusion in their issues management system or otherwise resolve these issues.

8. *Prerequisites PR-6.1, PR-6.2 and PR-6.4 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

PR 6.1, PR 6.2, and PR 6.3 reads as follows:

PR 6.1 SAR-420 and TS-420 have been prepared in accordance with 10 CFR 830 Subpart B requirements. SAR-420/TS-420 characterizes the hazards/risks associated with TREAT and identifies preventative and mitigating measures that protect workers and the public from those hazards.

PR 6.2 A SER has been received from DOE-ID for SAR-420/TS-420 and SAR-420/TS-420 are implemented and verified in accordance with LWP-9904/FRM-411/FRM-422.

PR 6.4 The USQ process has been effectively implemented at TREAT and SAR-420/TS-420 is included in the INL annual update process.

A review of the evidence files indicated that PR 6.1, PR 6.2, and PR 6.4 was certified in writing by J. R. Biggs, TREAT Operations Manager/Nuclear Facility Manager on May 25, 2017. Review of the evidence provided concluded that sufficient evidence is available to support the certification.

CONCLUSION:

This objective was met. There were no findings identified and there was one Noteworthy Practice identified.

Based on interviews conducted and a review of a sampling of procedures and facility records, the CRA team concludes that the facility SAR, TS, ESA, and OTP are in place and describe and protect the safety envelope of the facility and experiment operations. Nuclear safety and USQ procedures are in place to maintain the safety basis, and sufficient knowledgeable personnel are available to implement the program and support the facility.

FINDINGS

None

NOTE WORTHY PRACTICES

SB1-NWP-1: The TREAT-ESA-001 Table 1 summary of experiment safety analysis commitments, including the reference to the ESA section that derives the commitment, is identified as a Noteworthy Practice to facilitate communication of the commitments derived and the location of their Bases.

Assessed by:	Anne McCartin **CRA Team Members**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Training & Qualification

Functional Area:	Objective: TQ1	OBJECTIVE MET	
Training & Qualification	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

TQ1: Line management has established a Training and Qualification SMP to ensure safe accomplishment of work. The selection, training, and qualification programs for operations and operations support personnel have been established, documented and effectively implemented. Training and qualification requirements for each position encompass the range of assigned duties and activities. The selection process and applicable position specific training for managers ensures competence commensurate with these responsibilities. The level of knowledge of Training managers and staff is adequate based on review of records, interviews, and observation of training activities.

CRITERIA

1. A Training and Qualification (TQ) program has been developed, documented, and approved and implements the requirements of DOE Order 426.2. In this regard: TQ requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements; a Training Implementation Matrix (TIM) or equivalent successor document has been developed by BEA, approved by DOE-ID, and is incorporated in the TQ processes and procedures in place at the TREAT facility; and the TQ processes and procedures in place at the TREAT facility are adequately implemented in support of the facility.
2. Training and qualification requirements (encompassing the range of duties and activities to be performed) for operations and support personnel have been established and documented, and personnel have been trained and qualified to these requirements.
3. Required training and provisional qualification/certification necessary to Support TREAT restart is complete and documented.
4. The selection process and applicable position-specific training for managers ensures competence commensurate with responsibilities.
5. Modifications to the facility have been reviewed for potential impacts on training and qualification and, as required, training has been performed to incorporate all aspects of relevant changes to ensure safe operations.
6. Sufficient qualified personnel are available to effectively implement the TQ program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the TQ program is adequate based on review of records, interviews, and observation of operational demonstrations.
7. Adequate procedures, facilities and equipment are available to ensure that TQ support and services are adequate for safe facility operation.
8. Prerequisites PR-3.1, PR-3.2, PR-3.3, PR-3.4, PR-3.5, and PR-4.1 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.

REVIEW APPROACH

Review TQ program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with TQ.

Review the Training Program Description and Training Implementation Matrix, as well as referenced documents for implementation of applicable DOE O 426.2 requirements and documentation demonstrating DOE-ID approval of the Training Implementation Matrix.

Review the Training Program Description and Training Implementation Matrix, as well as referenced documents to verify a process exists to evaluate facility modifications for impacts to training, and to train and qualify appropriate personnel accordingly.

For a representative sample of facility modifications (e.g., hardware changes, software changes, temporary modifications, procedure changes, etc.), review documentation (e.g., impact reviews, changes to training documentation such as course materials, examinations, and training records associated with the revised training) to verify that training program requirements are being followed. Also specifically review notification documentation and interview the Training Manager and SMEs to confirm that the Training Organization was notified by the TREAT facility team of the modifications listed below prior to completion of installation/operation.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the training related role and responsibility interfaces with operations.

Review a representative sampling of documents and records that validate the implementation of TQ at the TREAT facility. These include:

- Management and independent assessment of TQ implementation at the TREAT facility and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the “health” of TQ implementation at the TREAT facility; including conclusions and assigned actions by senior management.
- MSA documentation associated with TQ implementation at the TREAT facility
- Status and documentation of all open and recently closed specific TQ issues, corrective actions, and Lesson Learned at the TREAT facility.
- Staffing plans for TQ support at the TREAT facility.
- TQ requirements and records for personnel involved with performing, supervising, and reviewing TQ activities at the TREAT facility.
- Procedures associated with TQ activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed or in-progress output documentation associated with TQ activities at the TREAT facility to evaluate the adequacy and completeness of the activities, including:

- A representative sample of reference materials and training documentation (e.g., operating procedures, job task analyses, lesson plans, course materials, on-the-job training (OJT) documentation, oral/written examination materials, etc.) to ascertain (1) if training materials are appropriately analyzed, designed, developed, delivered, and evaluated using a Systematic Approach to Training methodology; and (2) compliance to TQ procedure requirements.
- Training records (e.g., position descriptions, individual training plans, attendance rosters, OJT evaluations, written examination and examination results, oral board documentation) and tracking system documentation for a representative sample of operations, operations support, and management personnel to verify that personnel are appropriately trained, qualified, and tracked.
- A representative sample of documentation related to the selection of managers and their position-specific training to confirm that their competence commensurate with responsibilities is ensured.
- A representative sample of training and qualification records, examinations, and examination results for training personnel and training managers to verify an acceptable level of knowledge of project activities and safety basis requirements to effectively train operations and operations support personnel and provide proper management oversight.
- Documentation supporting evaluation of modifications for impact on training and associated training records where training was required.

Interview selected personnel who are involved in conducting, supervising, and reviewing TQ activities at the TREAT facility. Personnel interviewed will include: the Training Manager and select training instructors and evaluators. Confirm:

- Their level of knowledge and understanding of TQ program requirements and their implementation
- Their level of knowledge of reactor operations and safety basis requirements necessary to effectively train operations and operations support personnel and provide proper management oversight.
- Their role and responsibility interfaces with the operations organization.

Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level SMP procedures and the TIM.

Interview personnel involved with the evaluation of facility modifications for impacts to training and the implementation of actions to address these impacts.

Observe any training-related activities that may be occurring during the CRA (e.g., performance of OJT, conduct of written and oral examinations, classroom training, TQ planning meetings etc.).

Confirm sufficient TQ staffing and equipment are available to support operations.

Confirm procedures and work documents that implement TQ requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Confirm that the knowledge of TQ staff and management is adequate.

Reviewer

Dwight Kraai

Records Reviewed

- DOE O 426.2 Chg 1, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*, 7/29/2013

- *DOE-STD-1070-94 Assessment of the WIPP Training and Qualification Programs*, 6/18/2014
- PDD-218, TREAT Nuclear Facility Training Program, Revision 1, 10/06/16
- SD-49.2.1, Roles and Responsibilities for TREAT Program Oversight and Assurance and TREAT Training, Revision 5, 04/11/17
- SD-49.4.4, TREAT Operations Roles and Responsibilities, Revision 3, 04/13/17
- SAR-420, Transient Reactor Test Facility FSAR, Revision 28, 03/01/17
- TS-420, Technical Specifications for the TREAT Facility, Revision 1, 03/01/17
- ASMT 2017-0628, Final Report for the Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity, Revision 0, 05/08/2017
- TREAT Training Conditions – MSA April 2017
- TREDLA03, Reactor Startup Training: Simulator and Applied Theory, Revision 00, 12/19/16
- TREDLA04, TREAT Integrated Exercise SEG 1 – Reactor Operations – Startup-Steady State-Shutdown, Revision 00, 12/19/16
- TREDLA05, TREAT Integrated Exercise SEG 2 – Startup-Heat Balance-Rod Worth Determination (DLA), Revision 00, 12/19/16
- TREDLA06, TREAT Integrated Exercise SEG 3 – ARCS Operations File Creation, Full and Partial Simulation, Revision 00, 12/19/16
- TREDLA07, TREAT Integrated Exercise SEG 4 – Transient Operations, Revision 00, 12/19/16
- TRED008P, TREAT Drill Guide – Abnormal Hydraulic Response During Power Operations, Revision 0, 6/14/17
- TREAT Qual List – Operations
- TREAT Qual List – Instructors
- TREAT Control Technician
  - Task List, 9/20/16
  - QNTFOTCT, Qualification Card, 9/20/16
  - 361.92, Education and Experience Form, 2/24/15
  - 361.88, Qualification Endorsement
  - TREAT TCT Task Qualification Report
- Transient Control Specialist
  - Task List, 9/20/16
  - QNTSOTCS, Qualification Card, 9/20/16
  - 361.92, Education and Experience Form
  - 361.88, Qualification Endorsement
- Auxiliary Operator

  - Task List, 2/23/17
  - QNTF0AUX, Qualification Card, 2/28/17
  - 361.92, Education and Experience Form
  - 361.88, Qualification Endorsement
- Provisional Reactor Operator
  - Task List, 5/23/17
  - QNTFPRRO, Provisional Reactor Operator Qualification Card, 7/16
  - Completed Certification Exam, Walkthrough and Oral Board
  - 361.92, Education and Experience Form, 7/16
  - 361.88, Qualification Endorsement, 4/17
- Provisional Senior Reactor Operator
  - Task List, 5/23/17
  - QNTFPRRO, Provisional Senior Reactor Operator Qualification Card, 7/16
  - Completed Certification Exam, Walkthrough and Oral Board
  - 361.92, Education and Experience Form, 7/16
  - 361.88, Qualification Endorsement, 4/17
- TREAT Mechanic Task Qualification Report
- Maintenance 2016 -2017 2 year Continuing Training Plan
- Operations 2016 – 2017 2 year Continuing Training Plan
- QNNFM069, TREAT Nuclear Facility Manager
- FRM-1662, TREAT Support Manager
- TREAT Support Manager qualification records
- TREAT Operations Manager qualification records
- 361.57, BEA Newly Assigned Employee Checklist
- FRM-2404, TREAT Initial Criticality Practical Factors for RO, Revision 1, 06/05/17
- FRM-2402, TREAT Initial Criticality Practical Factors for SRO, Revision 1, 06/05/17
- Interoffice Memorandum from Kinghorn to Broussard, LWK-09-17 PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity, May 23, 2017
- PDD-10002, Engineering Training Program
- R2A2-10004, Cognizant System Engineer
- TREAT Broad-based Analysis of R2A2-10004
- QNTFCSEN, TREAT Facility Specific Checklist for Cognizant System Engineer
- TREAT Cognizant System Engineer training records

- Interoffice Memorandum from Broussard to Bumgardner, DJB-12-17, TREAT Operational Staffing Plan, May 23, 2017
- LI-15034, Canberra iCAM Operations, Revision 4, 6/8/17
- FRM-2394, TREAT Experiment Engineer Qualification Checklist, Revision 0, 03/29/17

Interviews Conducted

Training Coordinator

Training Instructors (2)

Operations Manager

Oversight & Assurance Division Director

Training Manager

Issues Management

TREAT Control Technicians (3)

Transient Control Specialists (2)

Reactor Operators (3)

TREAT Shift Supervisor (1)

HP Technicians (2)

Quality Engineer

Engineering Manager

MFC Radiation Control Instructor

Evolutions/Operations Witnessed

TREAT-OI-0507, Reactor Startup and Transient Evolutions

TREAT-OI-0502, ARCS Operations, File Creation, and Partial Simulation

TREAT-OI-0304, Fuel Handling Cask Operations

TRED008P, Abnormal Hydraulic Response During Power Operations

Pre-Job Briefs for the above evolutions

DISCUSSION OF RESULTS

1. *A Training and Qualification (TQ) program has been developed, documented, and approved and implements the requirements of DOE Order 426.2. In this regard: TQ requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated SMP requirements; a Training Implementation Matrix (TIM) or equivalent successor document has been developed by BEA, approved by DOE-ID, and is incorporated in the TQ processes and procedures in place at the TREAT facility; and the TQ processes and procedures in place at the TREAT facility are adequately implemented in support of the facility.*

Based on reviews of the training program implementing documents and after reviewing recent training program assessments, the review team concluded that the TREAT training and qualification program has been developed, implemented and approved and implements the requirements of DOE O426.2.

The TREAT Nuclear Facility Training, Qualification, and Certification program is approved and implemented in accordance with PDD-218, TREAT Nuclear Facility Training Program. The Program Description Document (PDD) meets the requirements of DOE 0 426.2 Contractor Requirements Document providing both a Training Implementation Matrix (TIM) and Training Program Plan (TPP). The PDD is approved by DOE.

During 2016, the TREAT training program assessments include:

- TREAT Independent Assessment IAS 16907, TREAT Training 1070 Quarterly for Objective 1.0 dated 3/2/16
- TREAT Independent Assessment IAS 16909, TREAT Training 1070 Quarterly for Objectives 2.0, 3.0, and 4.0 (except criteria 4.2) dated 5/17/16
- MSA ASMT 2016-0761, “Final Report for MSA for Readiness to Implement TREATSAR-420 and TS-420”, for Core Requirements 3 and 4

TREAT was assessed to DOE STD 1070-94 in January, 2017 as reported on ASMT 2017-0062. The conclusion of this comprehensive assessment was “*Nuclear training is generally well executed at TREAT. The overall rating of the assessment is SATISFACTORY. All staff observed and interviewed exhibited the highest degree of professionalism and technical competence”*.

A Management Self-Assessment for the Readiness for the TREAT Restart of Transient Testing Activity was conducted in April, 2017, resulting in three training quality related findings and five observations. The findings and observations have been entered into the INL issues tracking and management program and have corrective action plans in place. Over all the MSA team concluded that TREAT had demonstrated that the Plan of Action prerequisites had been met or will be met upon closure of Pre-Start findings, and thereby that TREAT equipment, processes, procedures, and personnel are adequate for safe operation of the TREAT Restart of Transient Testing Activity.

2. *Training and qualification requirements (encompassing the range of duties and activities to be performed) for operations and support personnel have been established and documented, and personnel have been trained and qualified to these requirements.*

Based on reviews of operator, technician, technical staff, and manager training records, interviews, and observation of multiple evolutions and drills, the review team concluded that the TREAT staff are trained and qualified to the training program requirements derived from a systematic approach to training through approved process and procedures. One noteworthy practice was identified.

The TREAT training program establishes training, qualification, and certification requirements appropriate for the full range of duties and activities performed by nuclear Management and staff. These requirements are summarized in PDD-218, Appendix D, TREAT Operations Qualification/Certification, Requalification/Recertification Requirements

TREAT positions listed in PDD-218 have qualification programs compliant with their guiding documents and contain a job analysis, qualification cards, examination bank (as necessary) and 2-year continuing training plans and all are captured in the INL TRAIN tracking system using Job Codes. Records are maintained in accordance with PDD-218, Chapter 1, section 10, Records.

One qualification, “ERO Bus Driver” was not captured in the position or individual job codes allowing two individuals to expire on the Bus Driver qualification. The TRAIN Job Code process is the tracking mechanism used at the INL to prevent a qualification from lapsing. CO 2017-1328 tracks this issue.

Manual 12 requires completion of Form 361.57, BEA Newly Assigned Employee Checklist upon assignment to a new position within the Company. Although this form is complete for TREAT employees, in some cases it was completed for the individuals previous positions within the Company and not completed when they were assigned to TREAT. CO 2017-1329 tracks this issue.

Qualification for the TREAT Control Technician (TCT) and Mechanics are based around “task qualifications”. Each task has a task completion signature, a manager sign-off, and a Training Coordinator signature for input into TRAIN. A TRAIN report was created that allows the individuals in quals and their management to see who is qualified to perform what tasks unsupervised. The methods used here could be implemented at many other nuclear facilities that employ task-based qualifications. This is a Noteworthy Practice.

Qualification for the Auxiliary Operator (AUX) was based around combining the Basic Operator and Nuclear Facility Operator qualifications and adding additional tasks (based on an analysis). The new AUX qualification card contains tasks from the earlier positions in addition to the newly identified task. This is an example of following the SAT process.

The RO and SRO/SS task lists were modified in January 2017 including changes to many task from Train/overtrain to Pretrain/just-in-time training however the current versions of the respective qualification cards do not reflect these changes (Qualification cards were last revised 7/16). These items were pen and ink deleted from the respective individuals qual cards to complete certification in April of 2017. TREAT management is aware of this and has chosen to delay revisions of qualification cards until after transitioning from Phase II through startup when they will perform a more comprehensive analysis and qualification program revision based on lessons learned. This action is captured in CA 2017-0694, Update the following qualification cards, AUX, RO, SRO, and SS; due to be completed 8/30/2017.

On-The-Job (OJT) qualification card, AFTF0HPT, Task HPTE04 is for equipment that is no longer used in the facility. The MFC Radiation Control Instructor is aware of this and plans on revising the task list and updating the qualification card. The change to the Canberra iCAM is considered part of the INL-wide RCT qualification process so TREAT specific training will not be necessary. There was a required read issued to all RCT's for LI-15034, Canberra iCAM Operations. CO 2017-1330 tracks this issue.

The training competencies for the Cognizant System Engineer (CSE) defined in DOE O 420.1C, Facility Safety, were rolled down through INL documents and a TREAT analysis but do not appear in the TREAT Cognizant System Engineer qualification process. The TREAT Engineering Manager provided sufficient evidence to show that the TREAT Cognizant System Engineers are fully qualified. This evidence was validated as correct by reviewing PDD-10002, Engineering Training Program and the individual Job Codes for the CSE's. There is no issue with how the CSE qualification has been implemented at the INL however, TREAT could clarify how qualification is achieved on their roll down analysis of R2A2-10004. SG 2017-0795 tracks this suggestion for improvement.

I reviewed FRM-2394, TREAT Experiment Engineer Qualification Checklist, and the analysis used to create the exp. eng. qualification program. The words "hazard analysis" are not present in the qual card or analysis however there is a competency to "Determine experiment accident scenarios and demonstrate compliance with SAR-420 requirements. This competency should be further evaluated to determine if it encompasses performing a hazard analysis.

3. Required training and provisional qualification/certification necessary to Support TREAT restart is complete and documented.

After reviewing the Training Program Manual, training qualification programs, records of qualified individuals, and training materials necessary to proceed past Phase II through restart and interviews with operations and training staff and management interviews, the review team concluded that the documented and DOE approved process for provisional qualification/certification is complete and documented.

PDD-218, section 4.1, Training Process, establishes the graded approach to implementing the Systematic Approach to Training (SAT) process as outlined in DOE O 426.2 and in accordance with INL Manual 12, Training and Qualification.

TREAT Training Program materials have been developed and maintained in accordance with Manual 12 requirements. Training Program materials are reviewed and approved by appropriate incumbents, Subject Matter Experts, Line Management, and Training Management. Materials are configuration controlled in well maintained case files.

PDD-218 Chapter 2, Section 7.1 describes the process used to transition from Phase I (shutdown) through Phase II (provisional) to final operational certifications. Control Manipulations required to be completed upon initial criticality are captured on FRM-2404 and FRM-2402. Phase II provisional certifications are complete for 3 Reactor Operators and 3 Senior Reactor Operators using provisional qualification cards, a comprehensive, combined examination, a walkthrough and an oral board. This goes beyond the requirements specified in DOE O426.2.

SD-49.2.1, Section 4.4.19 states to Maintain the Qualified Watch-stander List (QWL) for TREAT Training. This is the only instance where maintaining a QWL (or watch bill) is mentioned. There is an up to date QWL for instructor related qualifications but the QWL's for other positions such as ops and continuing training are out of date. The Training Manager stated that a quarterly watch bill is approved by the Operations Manager and posted in the plant but it does not show data such as qualification expiration dates that would help ensure that only qualified operators take the watch. SG 2017-0796 tracks this suggestion.

Form-1754 Proficiency record only refers to shutdown (SD) RO and SRO and not the provisional or final RO or SRO position as identified in PDD-218, TREAT Nuclear Facility Training Program section 5.1. TREAT is currently in phase II where the SD positions have been superseded. SG 2017-0797 tracks this suggestion.

4. The selection process and applicable position-specific training for managers ensures competence commensurate with responsibilities.

Based on reviews of the operation and support manager qualification programs, TREAT manager training records, interviews, and observations of manager interactions during multiple evolutions, the review team has concluded that the selection process as well as the facility specific qualification of managers ensures competence commensurate with responsibility.

The training and qualification program for TREAT managers is in place and functioning. The program includes Education and Experience, Facility Specific training, and Management and Supervisory training.

TREAT Managers are assigned the applicable Job Codes for qualification and complete either QNNFM069, TREAT Nuclear Facility Manager or FRM-1662, TREAT Support Manager qualifications depending on their position.

All TREAT facility specific qualification requirements have been completed by all assigned managers.

All TREAT managers and supervisors meet the entry education and experience requirements defined in PDD-218, Appendix B, Table B-1 and is documented on Form 361.92; present in the individual training records.

Observations of manager interaction with staff during evolutions, in pre-job briefs, and during meetings demonstrates a knowledgable, concerned management team fostering an open communications environment.

Interviews with management has consistently shown a high level of facility specific knowledge.

Supervisory skills training required in PDD-218, Chapter I, section 4.2.5.1 has been completed by all TREAT managers and supervisors. This training has been approved by DOE to meet the minimum Order requirements for supervisory skills training.

Additional supervisory skills training has been identified in INL Manager Job Codes. Some of these additional training requirements have not yet been completed. This is documented in CO 2017-0921 which has an approved corrective action plan to track through to completion. This does not affect the decision as to this criterion being met as there is sufficient evidence to show that the management team completed qualifications that are DOE O426.2 compliant.

5. *Modifications to the facility have been reviewed for potential impacts on training and qualification and, as required, training has been performed to incorporate all aspects of relevant changes to ensure safe operations.*

After reviews of document and facility modifications and the subsequent training process and in discussions during interviews the review team has concluded that there is a process in place that identifies and tracks to completion required training resulting from modifications to facility systems, equipment and procedures to ensure safe operation.

PDD-218, section 7.1, notes that “Initial training programs will be modified, as necessary, to address the current operational status of TREAT facilities”. “As facility status and/or program scope changes, modifications are implemented in accordance with Manual 12”.

The INL system modification process used at TREAT ensures that a training decision is made during the process. Additionally the document change request and USQ process both have a requirement to determine training applicability prior to issuance of any new or revised procedure. The TREAT training organization is also selected as a mandatory reviewer for document revisions as a second check. The most recent change to TREAT-OI-0304, “Fuel Handling Cask Operations” was reviewed to evaluate effectiveness of these processes and training was identified and tracked to completion prior to issue.

The change from the NMC Contamination Area Monitor (CAM) to the Canberra iCAM including the most recent revision to the procedure were trained. Revision 4 of LI-15034, Canberra iCAM Operation was only issued after a required read was completed and a Tailgate training session performed however, I can find no evidence that the company training request process was followed. This is at the INL Radiation Control Organization level.

A training request was given to the Training Coordinator on 6/5/17 regarding changes to SP-50.1.7, Implementation of LWP-13014, “Determining Quality Levels.” The training request identified training be complete by 6/15/17 (required read). A TRAIN report on 6/12/17 shows that all identified individuals have completed the training prior to the requested completion date.

6. *Sufficient qualified personnel are available to effectively implement the TQ program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing the TQ program is adequate based on review of records, interviews, and observation of operational demonstrations.*

Based on reviews of applicable documents, interviews, and observation of multiple demonstrations, the review team concluded that sufficient numbers of knowledgeable managers and staff are available to implement the TQ program.

There are sufficient qualified personnel available to effectively implement the TQ Program in support of the facility. There are two qualified SRO instructors as specified in DJB-12-17, TREAT Operational Staffing Plan.

There are 24 qualified On-the-Job Instructors/Evaluators) who are authorized to perform instruction on equipment that they are trained, qualified, and competent to operate. On-the-Job Evaluation is exclusively conducted by either the Operations Manager or Training Manager (both qualified Nuclear Facility Managers)due to the unique condition of TREAT.

Classroom Instructors are authorized to perform instruction on topics, subject matter, and equipment for which they are trained, qualified, and competent. All training materials are reviewed by INL qualified Instructional Specialists (IS) for SAT integrity. Although TREAT does not retain an IS on staff, there are sufficient IS's at MFC to meet TREAT program needs.

Interviews indicated that current staffing is adequate to meet ongoing and upcoming training needs, but requires some attention moving forward to funding levels to accomplish this. The Operations Manager is aware of and is planning for staffing changes in the future. Staffing plans were provided.

Training and qualification requirements for those positions listed in Appendix D of PDD-218 including: Reactor Operator, Senior Reactor Operator, Transient Control Specialist, Cognizant System Engineer, and Nuclear Facility Manager are completed and documented.

7. *Adequate procedures, facilities and equipment are available to ensure that TQ support and services are adequate for safe facility operation.*

After reviews of applicable documents, interviews, and facility walkdowns, the review team concluded that the procedures, facilities and equipment adequately meet TREAT training needs leading to safe facility operation.

Due to the small staff size of TREAT, the rooms available for training, although not dedicated, are adequate to meet any training needs. Additionally, TREAT relies on Instructional Specialists from their parent organizations training department (MFC) to perform SAT compliance reviews of training materials. Interviews with the instructional staff has indicated that this interface has not been an issue.

TREAT utilizes INL Company Manual 12, “Training” procedures to implement the training programs defined in PDD-218. An issue regarding compliance with Manual 12 requirements (CO 2017-0920) identified during the MSA is being tracked to completion in the INL issues tracking system. Actions identified for completion updating the RO and SRO task list, validating the task to training matrix, updating the qualification cards, and updating the lesson plans; all to be complete by 10/16/17.

8. *Prerequisites PR-3.1, PR-3.2, PR-3.3, PR-3.4, PR-3.5, and PR-4.1 have been certified in writing by BEA as having been met and sufficient evidence is available to support the certification.*

The above pre-requisites were certified in writing to be complete in an Interoffice Memorandum from Kinghorn to Broussard, LWK-09-17 PLN-5146, Contractor Readiness Assessment Plan of Action for the TREAT Restart of Transient Testing Activity, May 23, 2017

After reviews of the identified assessments, the TREAT Training Program, and TREAT manager and employee training records the review team confirms that the evidence presented adequately answers these prerequisites.

Conditions CO 2017-0919, 0920, and 0921 were entered into TREAT's issues tracking system to address those issues identified in the MSA that rose to the level of a condition. All three conditions have corrective action plans written and one (0921) is completed. All MSA Observations have also been entered with corrective action plans in place.

CONCLUSION

This objective was met. No findings were identified. One Noteworthy Practice was identified.

A Training and Qualification Program is developed, documented, and approved, and it implements the requirements of DOE O 426.2, as documented in PDD-218 which combines a TPM and TIM. Requirements for operations and support personnel are established, and personnel are trained to these requirements. Managers are selected and trained in a manner that ensures competence commensurate with their responsibilities. TREAT has adequate numbers of qualified and knowledgeable training staff, as well as adequate facilities and equipment to support safe facility operations appropriately. TREAT management and staff were available and actively participated in demonstrating an exceptional level of knowledge in their areas of responsibility.

FINDINGS

None

NOTE WORTY PRACTICES

TQ1-NWP-1: Qualification for the TREAT Control Technician (TCT) and Mechanics are based around “task qualifications”. Each task has a task completion signature, a manager sign-off, and a Training Coordinator signature for input into TRAIN. A TRAIN report was created that allows the individuals and their management to see who is qualified to perform what tasks unsupervised. The methods used here could be implemented at many other nuclear facilities that employ task-based qualifications.

Assessed by:	Dwight Kraai **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

ASSESSMENT DOCUMENTATION FORM

(FORM 1)

Waste Management

Functional Area:	Objective: WM1	OBJECTIVE MET	
Waste Management	Date: 06/16/2017	YES ☒	NO ☐

OBJECTIVE:

WM1: Line management has implemented a Waste Management (WM) SMP to ensure safe accomplishment of work. The level of knowledge of WM managers and staff is adequate based on review of examinations and examination results, interviews, and observation of operational demonstrations.

CRITERIA

1. WM requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.
2. Adequate procedures, facilities and equipment are available to ensure that WM support and services are adequate for safe facility operation.
3. Sufficient qualified personnel are available to effectively implement the WM program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing WM is adequate based on review of records, interviews, and observation of operational demonstrations.

REVIEW APPROACH

Review WM program procedures to confirm that they have been developed, approved, and implemented within the laboratory wide requirements system in support of TREAT facility operation.

Review the TREAT SAR-420/TS-420 for provisions associated with WM.

Review selected documentation (e.g., administrative procedures, organization charts, and position descriptions) which establish the WM related role and responsibility interfaces with TREAT facility operations.

Review a representative sampling of documents and records that validate the implementation of WM at the TREAT facility. These include:

- Any permits, permit requirements if applicable, waste determinations, categorical exclusions etc. as required for determining if Waste Management Program requirements are implemented.
- Management and independent assessment of WM implementation at the TREAT facility and issues management documentation for issues identified through those assessments.
- Presentation material and other documents used to support senior management review of the “health” of WM implementation at the TREAT facility; including conclusions and assigned actions by senior management.
- MSA documentation associated with WM implementation at the TREAT facility

- Status and documentation of all open and recently closed specific WM issues, corrective actions, and Lesson Learned at the TREAT facility.
- Staffing plans for WM support at the TREAT facility.
- Training and qualification requirements and records for personnel involved with performing, supervising, and reviewing WM activities at the TREAT facility.
- Procedures associated with WM activities at the TREAT facility to ascertain the extent to which they are adequate in content, level of detail, acceptance criteria, and implementation of safety requirements – and have been developed with participation by end users and appropriate SMEs; verified to be technically correct and validated to be workable as written; reviewed through the USQ process; concurred with by appropriate SMEs; approved by line management; and controlled through the document control process.
- Completed or in-progress output documentation associated with WM activities at the TREAT facility to evaluate the adequacy and completeness of the activities.

Interview selected personnel who are involved in performing, supervising, and reviewing WM activities at the TREAT facility – to confirm their level of knowledge and understanding of WM activities at the TREAT facility; related controls and requirements and their implementation; role and responsibility interfaces with TREAT facility operation; and the acceptability of WM practices and behaviors. Ascertain how the TREAT processes and procedures conform to the laboratory wide requirements system and company level Safety Management Program procedures.

Observe WM related meetings, pre job briefings and actual work to determine if WM practices and behaviors demonstrate activities are being conducted safely at the TREAT facility and in a manner that will support and sustain operations. During observations of work performance, assess the ability of associated procedures and work documents to be performed as written.

Confirm sufficient WM staffing and equipment are available to support operations. Confirm that the knowledge of WM staff and management is adequate and confirm their demonstrated commitment to comply with procedure requirements.

Confirm procedures and work documents that implement WM requirements at the TREAT facility are adequate in content, level of detail, acceptance criteria, and properly implement safety requirements.

Reviewer: Russ Leavitt

Records Reviewed

- MCP-17000, “Waste Generator Services Waste Management”
- LI-435, “Waste Management Routine Field Activities”
- LWP-17410, “Management of Waste Storage Areas”
- Satellite Accumulation Area (SAA) Operator Training Records
- TREAT Organization Chart
- Management Assessment of Waste management activities completed in February 2017

Interviews Conducted

- Experiment Safety Engineering Manager
- Rad Con Manager

- TREAT Program Integration
- Rad Con (3)
- Waste Generator Services
- Environmental Regulatory Compliance

Evolutions/Operations Witnessed

- Waste generation areas and waste management areas at TREAT, including universal waste battery, SAA, used oil accumulation, RMA, and industrial waste areas.
- Waste Determination and Disposition Forms (WDDFs) were reviewed for the waste streams observed. MFC-16-20, MFC-16-039, and MFC-17-015 were the identifiers of the determinations reviewed.
- The pre-job and cask handling operations were observed.

DISCUSSION OF RESULTS

1. *WM requirements are implemented at the TREAT facility through processes and procedures that have been prepared within the laboratory wide requirements system and incorporate associated Safety Management Program requirements. These processes and procedures are adequately implemented in support of the facility.*

TREAT works with the Waste Generator Services (WGS) organization to ensure proper waste management in accordance with regulatory requirements and company procedures. Interviews with TREAT personnel indicated that they knew who to contact for waste management. Waste accumulation and waste management was observed at TREAT. Waste areas reviewed included a satellite accumulation area (SAA), low-level waste accumulation, universal waste accumulation, used oil, and industrial waste. In addition, a review of TREAT waste determinations was performed.

Notable practices included placing a reminder on the universal waste container stating the requirement to mark a start date for items placed in the container. Two of the metal boxes used to accumulate low-level waste had detailed inventories. The operator was able to answer specific questions concerning waste characterization of individual items.

BEA performs management assessments of waste management activities. The Management Assessment of the BEA Low-Level Waste Management Program completed on 2/8/17 did not identify any issues relating to the LLW management program. Although this assessment was not specific to TREAT activities it reviewed the overall BEA waste management program.

There were a couple of waste management observations noted. One of the containers in the SAA waste not labeled with an IWTS barcode as required per LWP-17410, section 5.5. The concern was corrected at the time of discovery. Also, SAA containers are required to be maintained closed. The lids were on with the rings in place, however, the rings were not clamped. This concern was corrected at the time of discovery. Because the lids were in place and waste could not easily spill if turned over, this was identified as on observation only.

Finally, one of the metal boxes used to accumulate low-level waste did not have an inventory as required by MCP-17000 and LI-43, section 5.2.2.9. TREAT personnel responsible for the waste accumulation said the process would be to provide an inventory once they had accumulated waste. Technically, the inventory requirements could be met, however, such a practice would not ensure traceability from the point of generation to final disposal.

A review of the waste determinations for the waste streams reviewed was performed. These determinations were documented on form 435.39 as WDDF MFC-16-020, MFC-16-039, and MFC-17-015. No technical errors were identified and the determinations covered the waste streams.

2. *Adequate procedures, facilities and equipment are available to ensure that WM support and services are adequate for safe facility operation.*

Processes at TREAT were reviewed to the requirements of three primary waste management procedures. MCP-17000, Waste Generator Services Waste Management specifies INL waste management processes. LWP-17410, Management of Waste Storage Areas contains the INL requirements for waste accumulation areas. LI-435, Waste Management of Routine Field Activities, has the requirements for safe waste management activities. These procedures are adequate for safe and compliant waste management. TREAT has adequate facilities and equipment to manage the waste which could be generated.

3. *Sufficient qualified personnel are available to effectively implement the WM program in support of the facility. The level of knowledge of managers and staff responsible for administering and implementing WM is adequate based on review of records, interviews, and observation of operational demonstrations.*

An observation was made that the TREAT organization chart did not identify a single generator point of contact to ensure the generator responsibilities are accomplished as identified in the procedures reviewed. TREAT management has taken steps to identify a single point of contact on the organization chart. The organization chart identified a specific WGS contact.

Training was reviewed for the operator and user of the SAA. The responsible personnel for the SAA had the required training. INL ESH training for BEA employees was also reviewed. The purpose of this review was to evaluate if technicians and operators are given sufficient information to identify when to contact WGS (Waste Generator Services). Two online trainings were reviewed, INL935, INL Environmental Management System and IGET0000, INL General Employee Training. As an observation, these two on-line trainings focused on safety and health issues but had very little detail concerning compliant waste management. TREAT personnel could benefit from an annual review of waste and environmental requirements.

CONCLUSION

The objective regarding waste management has been met. There were no waste management findings. There were two deficiencies identified. There was one noteworthy practice identified.

The objective of this assessment was to verify that TREAT line management has implemented a Waste Management (WM) SMP to ensure safe accomplishment of work and to verify that the level of knowledge of WM managers and staff is adequate based on review of examination results, interviews, and observation of operational demonstrations. TREAT follows the established INL waste management program. None of the deficiencies rose to the level of a finding. The identified deficiencies indicate an immaturity in implementing the established waste management program. As long as line management continues to emphasize regulatory and procedural compliance and WGS is integrated into operations these types of error will be avoided in the future.

FINDINGS

None

Deficiencies:

WM1-DEF-1: Contrary to MCP-17000, "Waste Generator Services Waste Management", and LI-435, "Waste Management Routine Field Activities", no inventory is being kept for rad box container MFC160183.

WM1-DEF-2: The lid rings on two poly drums in the SAA were not clamped securely. (LWP-17410, "Management of Waste Storage Areas", and LI-435, "Waste Management Routine Field Activities"

NOTEWORTHY PRACTICES

WM1-NWP-1: TREAT was in the process of filling a couple metal waste boxes. An inventory was being kept for each item placed in the boxes. When questioned about the characterization, the operator was very knowledgeable about each item and was able to justify the characterization of each.

Assessed by:	Russ Leavitt **CRA Team Member**	**Approved by**:	Frank McCoy **CRA Team Leader**

APPENDIX 2

TEAM MEMBER BIOGRAPHIES

Mr. Frank McCoy (Team Lead): Mr. McCoy has over 45 years of experience in the operation, regulation, and management of Department of Energy (DOE), commercial, and naval nuclear facilities including power and production reactors, chemical processing facilities, and laboratories. This experience has included management and senior executive positions with DOE, Department of Navy, and the U.S. Nuclear Regulatory Commission (NRC), as well as private sector companies. Currently Mr. McCoy is the Chief Nuclear Safety Officer with URS Professional Solutions. In this capacity, he provides technical and programmatic leadership for nuclear safety programs and initiatives, and advises and provides nuclear safety oversight services for URS affiliate projects and operations. He also serves as the Senior Advisor for the URS multi-site Nuclear Safety Functional Area Coordination Team (FACT), serves as the Chair for the URS multi-site Performance Assurance FACT, and is leading a working group to improve Emergency Preparedness across the corporation. Mr. McCoy frequently interacts with regulatory and oversight bodies including the NRC, DOE and NNSA-Headquarters, and the Defense Nuclear Facilities Safety Board (DNFSB) in the US; Department of Natural Resources and Canadian Nuclear Safety Commission in Canada; and the Nuclear Decommissioning Authority and Office of Nuclear Regulation in the United Kingdom (UK).

Over the past 14 years, Mr. McCoy has personally supported many national and international government sites and laboratories in the areas of safety review; incident and accident investigation; and safety culture and Safety Conscious Work Environment consultation and evaluation. He has also provided consultation and assessment services in the areas of high hazard facility management and operations; Integrated Safety Management (ISM), Environment Safety and Health (ESH), nuclear safety authorization basis development and implementation, activity level work planning and control, Operational Readiness, and Safety Management Program implementation including engineering, maintenance, radiological protection, quality assurance, chemical safety, environmental protection, emergency management, waste management and decommissioning. Mr. McCoy also recently led the successful corporate improvement initiatives to 1) develop and implement a URS Corporate Work Planning and Control Standard for activity level work planning and control and 2) develop and implement protocols and practices for improved Corporate Governance of AECOM affiliate sites and projects.

Mr. McCoy has served on third party independent review committees at DOE's Hanford Reservation, Brookhaven National Laboratory, West Valley Demonstration Project, Savannah River Site, and Los Alamos National Laboratory. He also has led Operational Readiness Reviews for nuclear facility startups – recently including those for resumption of waste emplacement at WIPP, the Los Alamos National Laboratory Plutonium Pit Machining and Pit Flow Sheet Operations (Readiness Assessments), Idaho Cleanup Project Integrated Waste Treatment Unit Startup (ORR), Oak Ridge National Laboratory High Flux Isotope Reactor Startup, the Brookhaven National Laboratory High Flux Beam Reactor Decommissioning, the Hanford River Corridor Project Building 324 Stabilization (Readiness Assessment) and the Separations Process Research Unit (SPRU) Intrusive Decontamination and Decommissioning Resumption (Readiness Evaluation) – and has led Contractor Integrated Safety Management (ISM) Verifications – recently including those for Idaho National Laboratory and Idaho Cleanup Project, Lawrence Livermore National Laboratory, Hanford Tank Operations Project and Hanford River Corridor Project. Additionally, he served as the Senior Advisor for the Savannah River Liquid Waste Operations and the Hanford Mission Support Operations Contractor ISM Verifications and the Contractor Readiness Assessment for startup of the Integrated Waste Treatment Unit following the June 2012 pressurization event.

From 2008 – 2012, Mr. McCoy was involved in international nuclear consultation in Canada and the UK. He led independent program and project reviews for the Canadian Government and Canada's Crown Corporation, Atomic Energy Canada Limited (AECL). These reviews included independent 3rd party reviews of the $2 billion investment and infrastructure needs at Chalk River Laboratories; independent 3rd

party reviews of the appropriateness of actions, projects, and programs established to assure reliable medical isotope production in Canada with the National Research Universal Reactor; and program and project reviews of the multi-billion dollar Canadian Nuclear Legacy Liabilities Program. He also provided consultation, support, and assistance to executive management with Sellafield Limited in the United Kingdom in the areas of nuclear safety improvement, performance assurance, incident investigation, and corrective action management.

Before retiring from government service and joining URS Professional Solutions, Mr. McCoy was a senior executive for the DOE where his last assignment was serving as the Deputy Manager at the Savannah River Site. He also served as a Special Assistant to the Under Secretary of Energy where he (1) led DOE's successful effort to establish and implement an Integrated Safety Management System across the DOE complex and (2) led the United States delegation of nuclear safety experts to Japan in order to provide assistance to the Japanese government regarding the nuclear criticality accident at the Tokaimura uranium processing facility. Prior to joining DOE, Mr. McCoy held management positions at the NRC and Department of Navy.

Mr. McCoy earned a Bachelor of Science degree from The Citadel and a Master of Science degree in Physics from the Georgia Institute of Technology. He is a recipient of the Meritorious Executive Presidential Rank Award, two Secretary of Energy Awards, several DOE Exceptional Service Awards, and many other special act and service awards.

Mr. Melton S. Glenn, Jr. (Sam): Mr. Glenn has more than thirty-four years of experience in technical and strategic management of nuclear operations and large projects including: design, project management, risk evaluation and mitigation, budgeting, construction, and startup/testing. He has successfully served in diverse leadership roles for the US Navy, Department of Energy (DOE), and the National Nuclear Security Administration (NNSA): Manager of engineering and training organizations; senior technical advisor to the DOE Savannah River Site Manager; Manager of a project management, engineering, and construction oversight organization for a multi-billion dollar nuclear fuel cycle facility. Mr. Glenn has detailed knowledge of DOE and Nuclear Regulatory Commission (NRC) regulatory and licensing regimes and has significant experience resolving issues with both NRC and Defense Nuclear Facility Safety Board staffs.

Mr. Glenn has served on numerous Operational Readiness Review (ORR) and Readiness Assessment teams including teams for ORRs at the Waste Isolation Pilot Plant in New Mexico, the West Valley Demonstration Project in New York, and smaller projects at Savannah River and other DOE sites. He has served as a team member on Readiness Assessments at the Savannah River Site and Los Alamos National Laboratory.

Mr. Glenn was the Director, MOX Project Management Office, and Acting Deputy Federal Project Director, for the MOX Fuel Fabrication Facility, a $5 billion facility to manufacture fuel for US commercial power reactors from surplus weapons plutonium. In that role he managed oversight of construction, testing, design, procurement, project management, and contracting. Mr. Glenn was the Division lead for NRC licensing activities and preparations for testing/operations.

From 1995 to 1998 Mr. Glenn was the Technical Assistant to the Manager, DOE Savannah River Operations Office. He independently evaluated Savannah River Site operations, technical and administrative issues and recommend solutions to the site Manager. Mr. Glenn observed facility operations and evaluated projects to provide the Manager with an independent assessment of operations, status, and conditions.

During completion of construction and testing, Mr. Glenn was the DOE Program Manager for the Defense Waste Processing Facility, a $2.4 billion facility to vitrify liquid high level radioactive waste stored at the site.

Before joining DOE Mr. Glenn managed/supervised operation of the US Navy's schools for Radiological Controls Officers and Radiological Control Monitors in Charleston, SC. He supervised Health Physicist and technicians who trained Navy enlisted personnel and officers in radiological controls prior to their being assigned to Navy maintenance commands.
Mr. Glenn earned a Bachelor of Science degree in Mechanical Engineering from Clemson University. He is a recipient of the NNSA Administrator's Gold Medal, and DOE Distinguished Career Service Award.

Mr. Brooks Clements: Brooks has over 37 years of training, conduct of operations, maintenance, safety basis implementation and management experience in nuclear facilities. He currently serves as the Nuclear Safety Program Manager at the Waste Isolation Pilot Plant (WIPP). He holds a bachelor's degree in Applied Science specializing in Nuclear Engineering Technology from Thomas Edison University.

He began his career in the United States Navy Nuclear Propulsion Program where he spent eight and half years aboard the USS Texas (CGN-39) and at the AIW prototype as a staff instructor. Following his naval service he started work at the Idaho National Laboratory at the Advanced Test Reactor (ATR) and worked toward completion of his bachelor's degree. He worked at ATR for more than 20 years completing certifications as experiment operator, reactor operator, plant chemist, senior reactor operator, and shift manager. After certification as shift manager, he was assigned as System Operation (SO) test director following ATR core reconfiguration and installation of the ATR Loop Operating Control System (LOCS). He was later promoted and assigned a shift operating crew of plant, experiment, and reactor operators. He was subsequently promoted and qualified and as Nuclear Facility Manager with responsibilities for the ATR Critical facility (ATRC) as Reactor Manager and facility manager for the Nuclear Material Inspection and Storage facility (NMIS), both category 2 nuclear facilities. He was later assigned as the ATR Operations Assistant Manager with responsibilities for the day-to-day operation of the ATR with the 5 operating shift crews reporting to the position. After a rotational assignment as the ATR Complex Training Manager, he was appointed as the ATR Core Internals Change out (CIC) Tank Chain Manager, with responsibility for planning and execution of the critical path of the ATR CIC. The CIC outage was a $50M plus effort, requiring a 6 month long outage with over year spent developing and revising procedures for complete change out of the all of the reactor core components. After successful completion of the ATR CIC, he was assigned as the ATR Deputy Manager. After the designation of the ATR as a national scientific user facility, he was assigned as Manager of Readiness and Performance Assurance at the ATR Complex. His duties in this position included preparation for readiness activities associated with potential new facility modifications to support the ATR user facility mission.

In 2009 he accepted a position with Washington Group, later URS and then AECOM at the Waste Treatment Plant (WTP) at the Hanford site. As Area Operations Manager his responsibilities included all operations of turned over plant systems as well as line management for the maintenance department with the area maintenance manager reporting to this position. Maintenance responsibilities included all turned over plant systems as well as preservation maintenance of assets awaiting installation. As WTP construction progressed toward startup, he was assigned as the WTP Balance of Facilities (BOF) Manager with responsibilities for preparation of initial operations workforce hiring and development of BOF systems training and procedure development. During this tenure he was appointed as the URS-AECOM Nuclear and Environment Operations and Maintenance Functional Coordination Team (FACT) chairman. In 2016 he accepted his current position at WIPP. As Nuclear Safety Program Manager he oversaw nuclear safety efforts to successfully complete readiness assessment activities for the startup of the Interim Ventilation System (IVS) and contractor and DOE ORR of the WIPP facility. He has also

received formal Readiness Review Team Member (SAF-290) and Team Leader (SAF-291) training sponsored by the DOE sanctioned National Training Center.

Mr. Jeff Lietzow: Mr. Lietzow has more than 33 years leadership experience in safety analysis, safeguards and security, licensing, operations support and environmental compliance of both commercial nuclear power facilities and DOE complex nuclear facilities. His experience includes managing the Savannah River Site (SRS) Technical Safety Requirements and Functional Classification organizations, where he led the development of DOE's first Functional Classification Methodology, provided licensing support, resolved nuclear safety issues in concert with the Defense Nuclear Facility Safety Board (DNFSB), and developed and maintained SRS reactor and non-reactor facility technical safety requirements. In addition, he participated and advised at several facilities in the areas of Basis for Interim Operations (BIOs), Justification for Continued Operations (JCOs), and Potential Inadequacy in the Safety Analysis (PISAs), and Unreviewed Safety Question (USQ) determinations. Mr. Lietzow also functioned as Manager for SRS Safety Documentation Department for a range of facilities including Reactors, Waste Tanks, Tritium, Plutonium and Uranium Processing, Defense Waste Processing, and Solid Waste Storage. He also oversaw the Integrated Safeguards and Security Management (ISSM) Program, which provided vulnerability assessments, physical security engineering, material control and accountability, and simulation support.

During this time he also participated in numerous Contractor Operational Readiness Reviews (CORRs), Readiness Assessments (RAs), and Management Self Assessments (MSA) at SRS and other DOE Facilities including the DARHT facility at Los Alamos, Integrated Waste Treatment Unit (IWTU) at the Idaho Nuclear Technology and Engineering Center of the Idaho Cleanup Project and the Waste Isolation Pilot Project (WIPP).. He has successfully completed the U.S. Department of Energy National Training Center, SAF-291, Readiness Review Team Leader and SAF-290, Readiness Review Team Member, courses. Mr. Lietzow has also participated in the URS Work Planning & Control Phase II compliance assessments at multiple sites and was a member of the Independent URS Corporate Team Management Review at the Separations Process Research Unit (SPRU). He has provided on-shift Coaching and Mentoring to the WRPS Tanks Farms Central Shift Manager and supported the establishment of a Shift Technical Engineer (STE) program. Also, in preparation for a Readiness Assessment for the WRPS 242-A Evaporator, Mr. Lietzow provided Coaching and Mentoring in the area of Conduct of Operations and implementation of Safety Basis documentation with a focus on the Technical Safety Requirements.

Most recently he has provided support for the SRR Contractor Assurance Organization in the areas of Independent Integrated Evaluations, Self-Assessments, Corrective Action Effectiveness Evaluations, specializing in the areas of Engineering, Conduct of Operations, Emergency Preparedness, and Safety Basis, and development of the three year Integrated Assessment Plan.

Mr. Lietzow's commercial experience also includes 10 years at the Davis-Besse Nuclear Power Plant where he served as a nuclear licensing specialist, Environmental Compliance Supervisor and Control Room Shift Technical Advisor (STA). Mr. Lietzow was certified as a Senior Reactor Operator and acquired valuable experience in operations, regulatory compliance, nuclear licensing, nuclear system design, and environmental stewardship. He was a key member of the Licensing Staff, supporting the Davis-Besse restart effort from the total loss of feedwater event and acted as a primary interface with the NRC, restart regulatory negotiations team member, and on-call technical resource to facilitate discussions between Licensing, Operations, and the NRC.

At Sellafield, UK, Mr. Lietzow supported the development and implementation of the Safety Case Improvement Program along with the Decommissioning Safety Case Improvement Course of Action. Additionally, he developed an alternative document which captured those items (structures, systems, components, and administrative controls) which defined the safe operating envelope contained within the

safety case. This initiative had immediate safety and efficiency implications on the facility floor from the perspective of discipline operations and operator knowledge of the safety case and those structures, Systems, and Components (SSCs) which are important to safety. He also supported the Low Level Waste Repository Performance Based assessment.

He has been responsible for project managing over fifteen (15) multi-million dollar projects in the areas of nuclear safety documentation and operational and facility modifications for both commercial nuclear and DOE.

Mr. Richard "Chip" Lagdon: Mr. Lagdon joined AECOM in January 2016 after retiring from the Department of Energy in December 2015. Since joining AECOM, Mr. Lagdon has provided support to the Nevada Test Site, Savannah River Site and Los Alamos National Lab. He has provided performance assurance support for NSTec and SRR and served as an engineering advisor to a panel convened to look at Waste Management issues at Los Alamos.

Previously, at the Department of Energy, Mr. Lagdon was appointed Chief of Nuclear Safety for Energy in January 2006, where he is responsible for nuclear safety of the Office of Environmental Management nuclear facilities until he retired. He also served as the Central Technical Authority for the Office of Environmental Management. He is responsible for a staff of technical experts that oversee all aspects of nuclear safety, provides technical advice to the Under Secretary and Secretary of Energy, the Secretary of Energy, and the Assistant Secretary for Environmental Management. Mr. Lagdon also led periodic Construction Project Reviews for the Department on EM's major nuclear construction projects to evaluate management systems, technical issues and project performance. He also served as the Director for the Office of Quality Assurance Programs with responsibility for Department's Implementation Plan for DNFSB Recommendation 2002-1, Software Quality Assurance. In addition, he served as the Deputy Director for Special Projects and Investigations where he was responsible for the Operational Readiness Review program, Criticality Safety, Safety Concerns, and the Accident Investigation Program. Mr. Lagdon conducted several Accident Investigation Training courses as well as serving as Board Chairperson for Type A and Type B Accident Investigations. He was one of the original authors of the Operational Readiness Review Order and has been involved with many operational readiness reviews since joining DOE in 1992.

Prior to joining the Department in the Office of Nuclear Safety in 1992, Mr. Lagdon served as a Reactor Plant Shift Test Engineer at Newport News Shipbuilding & Drydock Company. He was certified as a Shift Test Engineer by Naval Reactors on S6G and A4W reactor plants. He conducted the overhaul of the USS Eisenhower (CVN-69) and the construction of the USS Roosevelt (CVN-72) reactor plants.

Mr. Lagdon also has commercial nuclear power experience having held the position of NRC licensed Senior Reactor Operator at Georgia Power Company's Hatch Nuclear Power Plant where he shut down unit 2 from a world record run for boiling water reactors. He was also designated as Emergency Director and Fire Brigade Commander for the plant. He led the NRC Annual Emergency Response Drill for 2 consecutive years. His tenure as the Senior Nuclear Licensing Engineer for Florida Power & Light's Turkey Point Nuclear Plant involved project management of the security and emergency diesel upgrades, conducting containment analysis for hydrogen buildup following an accident, performing core reload calculations and preparing the Fire Probabilistic Risk Assessment..

Mr. Lagdon graduated from the U. S. Merchant Marine Academy where he received a Bachelor of Science in Marine Engineering with a Nuclear Engineering minor. He holds a Master's Degree in Engineering Administration from George Washington University and completed the Senior Executive Fellows Program at Harvard University. Mr. Lagdon retired from the US Navy Reserve in 2012 after 30 years of service where he was an Engineering Duty Officer and holds the rank of Captain. His last assignment supported the Future Carrier Program evaluating lifecycle maintenance options based on an

integrated product model for the new aircraft carrier. He was involuntary recalled to active duty to support Operation Noble Eagle and Enduring Freedom following September 11, 2001 and staffed the Operations Center and conducted fleet operations support. Mr. Lagdon resides in Aiken, SC with his wife Victoria.

Mr. Joe Biggerstaff: Mr. Biggerstaff has over thirty years' experience in a broad range of staff, manager, and professional assignments in ES&H, Radiological Controls, work planning, regulatory programs, operations support, and formal conduct of operations. He has extensive knowledge and field application of 10 CFR 851 and 835 in DOE facilities including those managed by SRNS, SRR and NWP –WIPP, and DUF6 Portsmouth/Paducah. He has numerous experiences in high potential and first time ES&H and radiological activities at NWP-WIPP & SRR. He served as the ESH Manager at DUF6 Portsmouth and participated in the process hazard reviews during MSA activities at the site. He was also assigned as the Recovery Radiological Control Field Manager at WIPP following the 2014 underground radiological event, and radiologically directed the initial entry to determine the cause of that event. He also led the Radiological and ES&H activities during the Accident Investigation Board investigation and sampling of the failed drum contents from the degradation of that container.
Mr. Biggerstaff trained, mentored, and coached WIPP ES&H staff as well as other functional area radiological workers on contamination control, decontamination techniques, alarm response, and job control waste handling and received senior level recognition at WIPP for developing and implementing a formal shift turnover program for the ES&H and Radiological Control organization. He also directed the comprehensive characterization surveys, decontamination, and rollback of underground areas that were not contaminated initially or were deconned and reclaimed following the event and prescribed the radiological PPE, containment devices, assisted with the ISM work planning process and significantly supported the initial and subsequent contaminated HEPA filter replacements at WIPP.

Prior to his assignments at WIPP, Mr. Biggerstaff was the lead SRR Radiological Control manager and ES&H point of contact for tank closure activities at the F & H Liquid Waste facilities on tanks 4-6, 10-13, 15, 16, 18, & 19. This included bulk waste and heel removal, chemical cleaning, tank component D&R, content sampling, and final grouting. He received the President's Award for his role in the successful initial sludge sampling of tank 5 & 6 in F Tank Farm. Additionally, he was the Radiological Control supervisor for cold run testing and radiological startup of the DWPF vitrification facility. He was a part of the Emergency Preparedness drill group, serving as a lead ESH controller lead Field Monitoring Team controller during numerous exercises and drills including annual evaluated exercises; and served as the lead ESH Field Monitoring Team controller in that capacity. In addition he has been a technical reviewer and considered a Subject Matter Expert on instituting proper ES&H and radiological controls in work control documents and procedures for field implementation.

He has assisted and performed management assessments, readiness reviews, ORRs and hosted Facility Evaluation Board teams as a POC for ES&H. He was a member of the Readiness Assessment team for Tank 5&6 final closure; served as point of contact during ORR activities for Tanks 18 & 19 Grouting and the Tank 12 Chemical cleaning projects; and served as facility host for Facility Evaluation Board audits. In addition, he participated as an ESH representative for the WSRC ORR activities for start- up of radiological operations of DWPF and served as the ESH point of contact for the associated DWPF DOE ORR.

Mr. Jerry Kurtz: Mr. Kurtz is currently the Radiological Engineering Manager for Washington River Protection Solutions and holds a BS in Technology from Excelsior college. Mr. Kurtz has 34 years of combined experience in operations and radiological control. Over the years, Mr. Kurtz has held positions in Navy reactor operations, DOE Radiological Control operations, Radiological control training, dosimetry, radiological instrumentation, and various management positions. Mr. Kurtz maintains Diplomate status with the American Academy of Health Physics (CHP), certified Associate Safety

Professional (ASP) through the Board of Certified Safety Professionals, and registration with the National Registry of Radiation Protection Technologists (NRRPT).

Dr. Allan Coutts: Dr. Coutts has over 35 years as a professional in design and operations support of chemical, high hazard, and nuclear process facilities. In this capacity, he has had multiple assignments involving most of the disciplines required to safely operate such facilities. These have included fire protection, physical security, mechanical design, structural design, control system design, project management, and vehicle design. During his career Dr. Coutts has consulted on both U.S. Nuclear Regulatory Commission (NRC) licensed and DOE projects, including the Mixed-Oxide Fuel Fabrication Facility (Aiken, SC), the Los Alamos National Laboratory (Los Alamos, NM), the Waste Isolation Pilot Plant (Carlsbad, NM), the Waste Treatment Plant (Richland, WA), and the American Centrifuge Plant (Piketon, OH).

His specialty is fire protection and risk mitigation in unique and high hazard facilities. He has experience in managing risk in both nuclear and non-nuclear facilities. Nuclear facility experience includes the preparation of Fire Hazards Analyses, Fire Risk Analysis, codes and standards compliance reviews, equivalencies, exemptions and safety analysis calculations for multiple DOE facilities. Non-nuclear applications have included risk management in commercial industrial facilities with combustible metal and dust explosion hazards. He has also consulted on multiple project teams demonstrating that hydrogen can be safety used as a vehicle fuel.

Dr. Coutts has managed multiple testing programs including an assignment in SRNL as a thermal hydraulic test engineer developing, managing, and performing reactor fuel coolant experiments. He developed the reproducible test protocols necessary to evaluate security barrier effectiveness for SRS. Specific to fire protection, Dr. Coutts has been involved in testing to establish flame spread ratings, characterize ozone explosibility, fire barrier testing and dust explosibility. In addition, he performed a technical study to demonstrate the feasibility of repurposing fire-rated bulkhead designs used in the maritime community to serve as fire barriers in nuclear facility applications.

Dr. Coutts served as the fire protection advisor to the Accident Investigation Board following the 2014 radioactive release from the WIPP site. He is the former chairman of the EFCOG Waste Drum Fire Panel, has provided technical support for the DOE- 3013 fire testing, supported 9975 fire analyses including extrapolation of test results to support safety bases at SRS. He also wrote and has routinely presented the EFCOG Safety Analysis Working Group training on fire source term analysis.

Dr. Coutts has authored multiple papers and reports on fire risk analysis, hydrogen safety standards, and hydrogen-fueled vehicle safety and served on the SFPE task groups that wrote the “SFPE Engineering Guide to Performance–Based Fire Protection, and Fire Risk Assessment”.

Mr. Forest H. Holmes: Mr. Forest H. Holmes served in the US Navy from 1976 until 1985. During his years of service he achieved qualifications as Machinist Mate 1st Class Petty Officer. In 1978 he completed Naval Nuclear Power School, Prototype training, and Engineering Laboratory Technician (ELT) training before assignment to the USS Henry L. Stimson. In 1981 Forest was selected for assignment as a prototype instructor at NPTU Idaho Falls. He served as a leading ELT and quality assurance inspector in addition to Engineering Officer of the Watch and Engineering Watch Supervisor duties.

In 1985 Forest received an honorable discharge from the US Navy and began a career in health physics at EG&G Idaho. His assignments included the Power Burst Facility for severe fuel damage testing, the Advanced Test Reactor (ATR) for a core internals change (CIC). His non-reactor assignments included the Radioactive Waste Management Complex where he supports transuranic waste handling operations and subsurface investigation activities and radiological engineering. In 1988 Forest was asked to take over implementation of the emergency preparedness program implementation efforts for EG&G Idaho.

Since that time he has participated in several internal the Idaho National Laboratory (INL) facility readiness reviews and several facility readiness reviews for non-INL facilities. Forest participated in supporting the Federal Emergency Management Agency in evaluating emergency management programs at several state and local agencies in support of the radiological emergency preparedness program.

Following his FEMA assignments, Forest was assigned to the ATR as the lead emergency management planner for the ATR. In addition to his duties at the INL, Forest also serves on the steering committee for the Department of Energy (DOE) Emergency Management Issues Special Interest Group (EMISIG). During his tenure at the INL, Forest has completed university courses in environment safety & health and emergency management related areas of study. Forest also supports the current INL contractor as a resource in completing evaluations of emergency management activities at other non-INL facilities, most recently the Waste Isolation Pilot Plant in 2014 and 2016.

Ms. Anne McCartin: Ms. McCartin has worked the last 10 years as a safety analyst in the Advanced Test Reactor (ATR), Reactor and Nuclear Safety Analysis Engineering Department, at Idaho National Laboratory. Ms. McCartin is responsible for the quality, technical approach, and timely completion of all ATR Complex nuclear facility Safety Analysis Report and Technical Safety Requirement revisions. In addition to safety basis revision preparations, Ms. McCartin provides expert technical reviews, oversees execution of the unreviewed safety question process, ensures comprehensive implementation of all safety basis documents, and participates in facility readiness activities. Ms. McCartin is a member of the ATR Complex Independent Safety and Operations Review Committee. In that role, Ms. McCartin performs independent reviews of Experiment Safety Analyses for experiments to be irradiated in the ATR and Core Safety Assurance Packages for ATR operating cycles. In addition, Ms. McCartin acts as the ATR Programs Technical Lead for the National Nuclear Security Administration's Office of Material Management and Minimization ATR Low Enriched Uranium Conversion Project.

Prior to joining the ATR Reactor and Nuclear Safety Analysis Department, Ms. McCartin spent nine years performing facility and project engineering in support of unreviewed safety question resolution and fuel transfer operations at the Idaho Nuclear Technology and Engineering Center at the Idaho Cleanup Project. In that capacity, Ms. McCartin was responsible for all aspects of project planning and execution, including safety basis document preparation, implementation, and readiness review. Ms. McCartin also served as the Idaho Nuclear Technology and Engineering Center Spent Nuclear Fuel Department lead for initial implementation of the Integrated Safety Management System and Voluntary Protection Program.

Ms. McCartin has a Bachelor of Science degree in Geological Engineering with a Geotechnical Emphasis from the University of Idaho and a Masters of Engineering degree in Nuclear Engineering from the University of Idaho.

Mr. Rick Runnels: Mr. Runnels has over 35 years of leadership experience in the nuclear industry including performance assurance, engineering, operations and management functions at Environmental Management (EM) and National Nuclear Security Administration (NNSA) U.S. Department of Energy (DOE) sites. Currently Mr. Runnels is a senior technical consultant and Operations Support Group Manager with AECOM Professional Solutions. In his consulting assignment, Mr. Runnels has provided operational assurance and readiness support activities at most nuclear facilities in the DOE complex and two in the United Kingdom (Sellafield and Low Level Waste Repository). Mr. Runnels has led and participated in numerous formal readiness reviews, led several ISM Phase I and Phase II certifications, participated in post-event accident investigations, led Work Planning and Control reviews at several nuclear sites in the DOE EM/NNSA complex, as well as led several performance based operational assessments across the complex and the UK. Mr. Runnels is also a certified NQA-1 Lead Auditor.

As Manager of the Operations Support Group with over twenty senior and mid-level subject matter expert (SME) technical consultants, Runnels' organization provides resource support across the DOE complex for various performance assurance, readiness/startup and operations improvement activities. He is also an

active member of the AECOM Functional Area Coordination Team (FACT) for Operations & Maintenance. He currently serves as the Vice Chair of the EFCOG Work Management subcommittee. Mr. Runnels has also been formally trained by the Institute of Nuclear Power Operations (INPO) in the conduct of Nuclear Safety Culture Assessments and has participated in Nuclear Culture Safety Assessments. He has also received formal Readiness Review Team Member (SAF-290) and Team Leader (SAF-291) training sponsored by the DOE sanctioned National Training Center. Mr. Runnels earned a Bachelor of Science degree in Mechanical Engineering from the University of South Florida.

Mr. Dwight Kraai – Mr. Kraai has been part of nuclear power for 37 years. His experience ranges from operations in the United States Navy to training at both Savannah River Site and the Idaho National Laboratory. Mr. Kraai's career has included being co-author of the DOE Task and Job Analysis process, Training Technical Lead and Experiment Handling Supervisor at the Advanced Technical Reactor, and Subject Matter Expert on Department of Energy training orders. Mr. Kraai has participated in assessments and assist visits at most of the DOE nuclear facilities.

Mr. M. Russell Leavitt: Mr. Leavitt graduated from Idaho State University with a Bachelor's Degree in Zoology; Suma Cum Laude. He then went on to earn a Master's Degree in Waste Management and Environmental Science with emphasis on Engineering and Biology. Mr. Leavitt co-authored a technical paper, *Success in Managing Waste with No Identified Path to Disposal at the Idaho National Engineering and Environmental Laboratory,* which was presented at Waste Management 2000.

Mr. Leavitt has over 17 years of experience in the management of industrial, hazardous, radioactive and mixed waste. This experience includes many decontamination and decommissioning projects. Mr. Leavitt was part of the team which commissioned the Idaho CERCLA Disposal Facility (ICDF). This included the acceptance of both solid and liquid radioactive and chemically contaminated waste for permanent disposal. Mr. Leavitt has served as the Waste Acceptance Subject Matter Expert for the Radioactive Waste Management Complex Subsurface Disposal Area (SDA). Mr. Leavitt was the Environmental Compliance lead over waste at the Naval Reactors Facility. His responsibilities included interpreting regulatory compliance issues and regulatory reporting.

Currently Mr. Leavitt works at the Materials and Fuels Complex (MFC) in the Waste Generator Services (WGS) organization. Current responsibilities include performing hazardous waste determinations, profiling waste for off-site disposal, and overseeing packaging for compliant shipping and disposal of regulated waste. He is responsible to ensure safe, compliant and cost-effective management of challenging waste streams at MFC.

Mr. Jason Andrus: Mr. Andrus is the Nuclear Safety Engineering Manager for the Materials and Fuels Complex at the Idaho National Laboratory. Jason has a Master's degree in Nuclear Engineering from North Carolina State University. He also obtained Bachelor degrees in both Nuclear and Mechanical engineering from Idaho State University. Jason has over six years of nuclear safety experience with a focus on safety analysis and compliant operations of nuclear facilities. He is a licensed Professional Engineer in the State of Idaho.

Mr. Alan Trost: Alan Trost began his career in the nuclear industry in 1985 as a Project Engineer / Computer Programmer for the INL. In 1987, he moved to the SMC project as the company statistician until leaving the INL to work for Siemens Nuclear in 1990. During Mr. Trost's tenure at Siemens Nuclear in Richland, Washington, he was a statistician working on the production floor of a fabrication facility as a Production Engineer. In 1995, He moved into the Quality Assurance organization as a QC Supervisor until taking a job a few years later in the QA Supplier Audit group performing supplier audits. He later worked in several QA positions, including Principle QA Engineer and Product Quality Manager, for AREVA in Richland, Washington. In 2007, Mr. Trost joined the INL as the site QA Program Manager. In 2012, he transitioned to NS&T QA Lead for the INL, which is the position he currently holds.

Mr. Anthony (Tony) Wilson: Mr. Wilson has over 29 years' experience in the nuclear industry. He worked at Lawrence Livermore Laboratories for two years as a Laser Electro-Optics Technician. He then came to the Advanced Test Reactor (ATR) at the INL and worked for seventeen years as an Instrumentation and Controls Technician performing troubleshooting and repair, as well as preventative maintenance activities. Tony then transitioned to ATR Plant Engineering as the I&C Engineer where he has spent the last 10 years.