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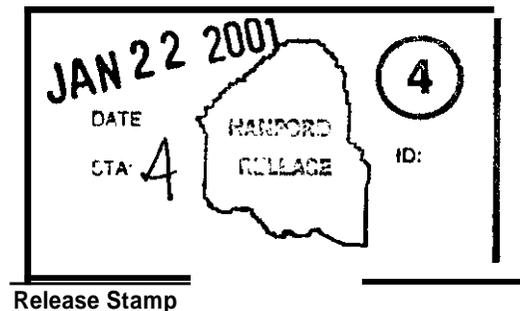
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PWR-2 Blanket Fuel Assembly Removal Safety Basis Criteria Document

**Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management**

**Project Hanford Management Contractor for the
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**PWR-2 Blanket Fuel Assembly Removal
Safety Basis
Criteria Document**

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1.0 INTRODUCTION

This criteria document describes the proposed format, content, and schedule for the preparation of an amendment to the *Interim Safety Basis for Solid Waste Facilities (T Plant)* (ISB), (HNF-SD-WM-ISB-006), and to the *T Plant Interim Operational Safety Requirements* (IOSR) (HNF-SD-WM-TSR-003). The amendments to these documents are intended to authorize removal of spent nuclear fuel (SNF) assemblies from the spent fuel pool in the Solid Waste Treatment Facility 221-T canyon for interim storage in the Canister Storage Building (CSB). The amendments will include a stand-alone safety assessment as well as revisions to these safety documents as needed to reflect the changes in work scope not currently authorized to accomplish the expected end-state of the Fuel Removal Project for the 221-T Facility.

1.1 Background

The 221-T Canyon Cell 2R contains 72 PWR-2 fuel assemblies that were irradiated in an experimental reactor in Shippingport, PA from 1965 to 1974. These blanket fuel assemblies absorbed the neutron flux from the seed assemblies and bred plutonium. Although these blanket assemblies could not sustain a criticality on their own, these fuel assemblies were located within the reactor with highly enriched seed fuel assemblies. The blanket assemblies were transferred to the spent fuel pool in the 221-T canyon at the Solid Waste Treatment Facility in 1978 and 1979 for storage prior to reprocessing to recover produced plutonium. The reprocessing operations were never initiated and the fuel assemblies have remained in storage in the 221-T spent fuel pool.

The Fuel Removal Project mission is to relocate the Shippingport PWR-2 fuel assemblies from the Solid Waste Treatment Facility to the CSB. Removal of these PWR-2 fuel assemblies will require loading the assemblies into Shippingport Spent Fuel Containers (SSFCs), drying and inerting the SSFCs, loading and transporting the SSFCs in a shipment cask to the CSB, and off-loading the SSFCs at the CSB. The Fuel Removal Project will also perform limited decontamination and decommissioning (D&D) of the Solid Waste Treatment Facility storage pool systems associated with cell 2R.

The current T Plant safety basis is the IOSR and the ISB, including the DOE-RL Safety Evaluation Reports (SERs) and the *Safety Assessment for Project W259* (HNF-2896). Safety related supporting documentation for T Plant includes:

- *Safety Assessment Document – PWR Core 2 Project* (RHO-CD-356),
- *PWR Core 2 Operations Safety Requirements* (RHO-CD-423),
- *T Plant Decontamination and Repair Facility* (WHC-SD-SQA-CSA-20104), and
- *Criticality Safety Evaluation Report for PWR Core 2 Blanket Fuel Storage Cell 4, 221-T Building* (HNF-4922)

Technical amendments to the safety basis are required to meet the full intent of the requirements of DOE Order 5480.23, *Nuclear Safety Analysis Reports*. The key areas to be addressed in the update are listed below:

- ◆ Solid Waste Treatment Facility Fuel Removal Project Execution Plan (in preparation),
- ◆ Shippingport PWR Core 2 Spent Fuel Removal Activities Safety Basis Criteria Document (this document),
- ◆ Solid Waste Treatment Facility Fuel Removal Preliminary Hazards Identification and Assessment (in preparation),
- ◆ A safety assessment (HNF-6459) and revision to the ISB and IOSR with supporting safety analyses (in preparation),
- ◆ "Shippingport Pressurized Water Reactor Core 2 Blanket Assemblies Source Term Calculations Using ORIGEN2", (HNF-SD-SNF-TI-061),
- ◆ A revised criticality safety evaluation report (HNF-6083, in the final review process),
- ◆ A Safety Analysis Report for Packaging (**SARP**) for the SSFC used with the Multi-Canister Overpack (MCO) shipping cask and transporter (a minor change is currently being prepared), and
- ◆ An amendment to the CSB safety basis to allow receipt and storage of the Shippingport PWR-2 blanket fuel assemblies (in the final approval process)

The Waste Management Project is in the process of developing the **Solid Waste Facilities Muster Safety Analysis Report (MSAR)** HNF-SD-WM-MSAR-001. When approved by DOE, the Solid Waste MSAR will replace the ISB. It is anticipated this will be implemented on a phased approach starting with T Plant in FY 2001.

The MSAR, which will follow the format of DOE-STD-3009-94, consists of a generic SAR for the Solid Waste Program augmented by facility specific annexes (i.e., LLBG, CWC, WRAP, Treatment Facility). The generic portion of the MSAR will include the Executive Summary and Chapters 1 – 17 (Chapters 6 through 17 are programmatic chapters). Chapter 3 will include a brief summary of facility accidents plus the consequences of a common bounding accident. The facility specific annexes, one of which will be for T Plant, will follow the format for Chapters 2 through 5 (DOE-STD-3009-94) and will include appendices (e.g., supporting calculations, Preliminary Hazards Analysis) as required, and facility specific accident discussions.

1.2 Purpose

The Project Hanford Management Contractor (PHMC) Implementation Plan (FDH 1999), for compliance of PHMC facilities with DOE Order 5480.22 and DOE Order 5480.23, was transmitted in May 1999 to the U.S. Department of Energy, Richland Operations Office (DOE-RL). This criteria document describes how the commitments made by the Implementation Plan or its update will be performed.

The purpose of this document is to establish the specific set of criteria needed for an amendment to the safety basis for T Plant per HNF-SD-MP-SRID-011, **Waste Management Hanford Standards/Requirements Identification Document**, Chapter 18, "Nuclear Safety".

Project Hanford Procedure HNF-PRO-705, *Safety Basis Planning, Documentation, Review, and Approval*, requires the development of a safety basis criteria document. This document provides the basis for an acceptable and adequate safety basis document. This criteria document must be approved by the safety review board as specified in the Waste Management Project safety analysis procedure and submitted to DOE-RL for information or concurrence prior to implementation.

As required by HNF-PRO-705, this criteria document addresses the following:

- The purpose for the safety basis document and schedule for development;
- The type of document(s) planned, their depth and detail, standards invoked, and format(s) to be followed;
- The scope of operation or activity that the documentation will cover, the life cycle and expected end-state condition(s) that the safety analysis must capture;
- Interfaces with other facilities or projects and their safety basis documentation ensuring that operations and activities are comprehensively and consistently addressed;
- Supporting assumptions and agreements used (e.g., site boundary parameters, worker safety criteria, any specific programmatic requirements); and
- The basis for the approach taken (e.g., facility hazard categorization, life cycle, complexity, etc.).

Included in this document are the safety basis document preparation and review schedules that are provided for concurrence by DOE-RL (see Section 2.7). This document will not address the changes, if any, in the CSB safety basis to allow the receipt and storage of the PWR-2 blanket fuel assemblies. This will be addressed independently as part of the **CSB** safety documentation package.

2.0 PLANNED SAFETY BASIS DOCUMENTATION

2.1 Proposed Safety Basis Upgrades

The existing T Plant Safety Basis documents will be amended to incorporate the following work scope changes impacted by PWR-2 Fuel Removal Project and D&D of cell 2R:

1. Prepare a fuel removal safety assessment and revise the T Plant ISB to adequately cover expected fuel removal and fuel pool D&D activities by:
 - a. Evaluating the current configuration of the 221-T Tunnel area and conducting a hazards analysis for the activities associated with PWR-2 Fuel Removal Project and D&D of cell 2R,
 - b. Addressing worker safety during the fuel removal and fuel pool D&D;
 - c. Updating accident analysis and identifying additional Safety Systems, Structures, and Components (SSCs) (if needed) to support activities;
 - d. Incorporating the results of all safety analyses that may be performed (e.g. criticality safety analysis, fire hazards analysis); and
 - e. Adequately reflecting the expected end-state of T Plant following a graded approach.

2. Modify the T Plant IOSR to include:
 - a. Modifications to the applicability statements of each IOSR, as needed, to allow the fuel removal and the fuel pool D&D activities, and
 - b. Changes to the applicability statements of each IOSR, as needed, when the IOSR may be either lessened or removed based on the end-point criteria of the T Plant.

2.2 Basis For Approach

The current T Plant ISB and IOSR safety basis documentation was developed in accordance with DOE Order 5480.23 and DOE-STD-3011-94 guidelines. **An** amendment to the ISB will be prepared for the T Plant in accordance with DOE Order 5480.23 and DOE-RL program direction.

Table 2-1 demonstrates compliance between the requirements of DOE Order 5480.23 and the current T Plant ISB. This table also indicates the proposed revision to the current T Plant ISB as a result of the activities and the expected end-states discussed in this criteria document which will be allowed under this update.

Table 2-1. T Plant Interim Safety Basis Report Compliance with DOE Order 5480.23

DOE Order 5480.23 8.b.(3) and Topics	T-Plant, ISB (HNF-SD-WM- ISB-006 , Rev 1B or IOSR (HNF-SD-WM-TSR-003 Rev 1) Section Reference	Actions Required for the safety basis update
a) Executive Summary	Not included	NIA
b) Statutes/Orders	ISB: Section 5.0 <i>References</i> , Subsections 5.1- <i>Code of Federal Regulations</i> ; 5.3- DOE Orders; 5.5- <i>Washington Administrative Codes</i>	Review for continuing applicability; no changes are anticipated.
c) Site Characteristics	ISB: Section 2.0 , <i>Site, Facility, and Organization Description</i> , Appendix C, <i>Safety Analysis</i>	Review for continuing applicability; no changes are anticipated.
d) Facility Description	ISB: Section 2.2, <i>T Plant Facility Description</i> ; Appendix 4 <i>Facility Description</i> ; and Appendix B, <i>Process Description</i>	Update description of planned activities and description of the end-state of the facility following a graded approach.
e) Hazard Analysis/ Facility Classification	ISB: Section 1.2 , <i>Conclusions</i> ; 3.1, <i>Hazard Analysis</i> ; Appendix D, <i>Hazards Categorization</i> ; Appendix F, <i>Memorandum of Understanding</i>	Hazard and Safety Analyses will be performed to address additional concerns originating from the planned activity for worker safety, operational activities during fuel removal, and fire hazards. Analysis is anticipated to maintain the facility classification as a Hazard Category 3; however, consideration of future missions may make it expedient to raise allowable facility inventory limits for other operations or segments above Hazard Category 2 threshold values in conjunction with this change to the authorization basis. Facility segments will be reviewed and modified as needed.
f) Health and Safety Criteria	ISB: Section 1.4 , <i>Summary of Configuration Management Systems</i> ; Section 4.0, <i>Hanford Generic and Facility-Specific Controls and Safety Programs</i>	Review for continuing applicability and updating as required for the fuel removal activity; no changes are anticipated.
g) Waste management	ISB: Section 1.4, <i>Summary of Configuration Management Systems</i> ; Section 4.0 , <i>Hanford Generic and Facility-Specific Controls and Safety Programs</i>	Review for continuing applicability and updating as required for the waste management of the fuel pool D&D.
h) Criticality Safety	ISB: Section 1.4, <i>Summary of Configuration Management Systems</i> ; Section 3.1.3, <i>Criticality Analysis</i> ; IOSR: Section 5.3	Criticality Analyses will be performed to address this concern during the fuel removal activity and to verify that MCO analysis for K Basin spent fuel is bounding for the fuel removal.
i) Radiation Protection	ISB: Section 1.4 , <i>Summary of Configuration Management Systems</i> ; Section 4.0 , <i>Hanford Generic and Facility-Specific Controls and Safety Programs</i>	Review for continuing applicability and updating as required for the fuel removal activity.

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DOE Order 5480.23 8.b.(3) and Topics	T-Plant, ISB (HNF-SD-WM-ISB-006, Rev 1B or IOSR (HNF-SD-WM-TSR-003 Rev 1) Section Reference	Actions Required for the safety basis update
(j) Hazardous Material Protection	ISB: Section 1.4, Summary of Configuration Management Systems; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs	Review for continuing applicability; no changes are anticipated.
(k) Event Analysis	ISB: Section 3.1, Hazard analysis; Appendix C, Safety Analysis	Review for continuing applicability and updating as required for the fuel removal activity.
(l) Management/Safety	ISB: Section 1.4, Summary of Configuration Management Systems; Section 3.2, Hazard Controls; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs IOSR: Section 5.2	Review for continuing applicability and updating as required for the fuel removal activity.
(m) Procedures and Training	ISB: Section 1.4, Summary of Configuration Management Systems; Section 3.2, Hazard Controls; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs	Review for continuing applicability and updating as required for the fuel removal activity.
(n) Human Factors	Not addressed	N/A
(o) Surveillance and Maintenance	ISB: Section 2.4, Status of Facility Improvements; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs	Review for continuing applicability and updating as required for the fuel removal activity.
(p) Technical Safety Requirements	ISB: Section 1.4, Summary of Configuration Management Systems; Section 3.2.2, Administrative Controls/Operational Restrictions; and IOSR	Review for continuing applicability and updating as required for the fuel removal activity based on the result of the Hazard and Safety Analyses.
(q) Operational Safety	ISB: Section 1.4, Summary of Configuration Management Systems; Section 3.2, Hazard Controls; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Program	Review for continuing applicability; no changes are anticipated.
(r) Quality Assurance	ISB: Section 1.4, Summary of Configuration Management Systems; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs	Review for continuing applicability; no changes are anticipated.
(s) Emergency Preparedness	ISB: Section 1.4, Summary of Configuration Management Systems; Section 4.0, Hanford Generic and Facility-Specific Controls and Safety Programs	Review for continuing applicability and updating as required for the fuel removal activity.

DOE Order 5480.23 8.b.(3) and Topics	T-Plant, ISB (HNF-SD-WM- ISB-006 , Rev 1B or IOSR (HNF-SD-WM-TSR-003 Rev 1) Section Reference	Actions Required for the safety basis update
(t) Decontamination and Decommissioning	ISB: Section 1.4, <i>Summary of Configuration Management Systems</i> ; Section 4.0, <i>Hanford Generic and Facility-Specific Controls and Safely Programs</i>	Review for continuing applicability and updating as required for the fuel pool D&D activities.
(u) Design Codes and Standards	ISB: Section 1.4, <i>Summary of Configuration Management Systems</i> ; Section 2.2, <i>T Plant Facility Description</i> ; Section 4.0, <i>Hanford Generic and Facility-Specific Controls and Safely Programs</i>	Review for continuing applicability; no changes are anticipated.

Per DOE Order 5480.23 and DOE-STD-3011-94, a graded approach will be used in determining the depth and detail of the safety analysis and safety basis documentation. Since the current authorization basis was recently upgraded, a complete revision of the T Plant ISB and reformatting to match the guidelines in DOE-STD-3009-94, *Preparation Guide for US Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, are not warranted. A Master Safety Analysis Report (MSAR) following the format of DOE-STD-3009-94 and a Master Technical Safety Requirements (MTSR) document are being prepared for solid waste facilities including T Plant that will replace the existing T Plant ISB when approved. Some inconsistencies because of non-current information may remain to be resolved by the MSAR in keeping with the approach used in the *Safety Assessment for Project W259* ("F-2896). Per ISB SER Rev 1, "Resolution of these issues in the MSAR or next annual update to the Interim Safety Basis will be determined based on available resources and applicable requirements," provided "there is low incremental risk of misunderstanding the intent or meaning of the approved authorization basis."

Section 2.3 discusses the application of the graded approach to the amendments and upgraded safety basis in greater detail.

2.3 Planned Depth And Detail

A graded approach will be used to determine the level of detail to be incorporated in the T Plant ISB and IOSR update. The level of detail is dependent upon a number of factors: the need for the upgrade, the hazard potential (and hazard categorization) of the facility, and the stage of facility life cycle. Each of these factors is discussed briefly below:

- Need for an Amendment and Update- The current safety basis documentation does not allow the movement of the fuel currently in storage. A new safety assessment and ISB and IOSR updates are required to authorize removal of the fuel and the activities that may be associated with that activity (e.g. removing the cover blocks, changes in water level, etc.). The end-state of the 221-T Plant, after the expected fuel removal activities, is expected to be without the fuel and the fuel pool water. Those document sections identified in Table 2-1 may require an update to reflect the change in function and configuration during the proposed activities of fuel removal. It should be noted

that an update to this document was completed in June 1999 that incorporated completion of Project W-259. This revision also addressed the prior removal of stored sodium metal from the T Plant Complex and provided reference to descriptions, accident analysis, and revised limits in HNF-2896, *Safety Assessment for Project W-259*). It also provided source strength inventory requirements and increased the allowable facility radiological inventory in waste containers. This update will be made in the same manner as the 1999 annual update. The latest annual update was completed in June 2000.

- Hazard Potential and Hazard Categorization - The T Plant Complex is currently categorized as a Hazard Category 3 facility based on segmentation of the various source terms throughout the complex to preclude interaction in common mode accidents. This includes an evaluation of the fuel inventory and the amount of material at risk during its storage. The fuel removal activity may require additional controls to assure that the complex remains a Hazard Category 3 facility during the activity (e.g., Section 3.6.3 of *Safety Assessment for Project W259* [HNF-28961]). The expected end-state of the complex is as a Hazard Category 3 facility based on the fuel removal operations; however it may be upgraded to Hazard Category 2 in conjunction with this authorization basis update in anticipation of unrelated future missions including K Basin sludge storage or treatment.
- Life Cycle - Future missions for Cell 2R are considered outside the scope of this study. The T plant expected end-state is outlined in Section 3.2.

2.4 Standards Invoked

The safety assessment will be consistent with DOE-STD-3009-94 and the guidance documents used in the development of the ISB and the IOSR for T Plant. These include DOE-STD-3011-94, DOE Order 5480.23, and DOE-STD-1027-92. DOE Order 5480.22 and DOE Order 5480.23 will be used to prepare the safety basis documents.

2.5 Format And Content of an Amendment And Upgrade to the T Plant ISB

In order to remain cost effective in conjunction with preparation of the MSAR, limited page changes will be made to the T Plant ISB and IOSR, similar to changes made for Project W-259 upgrades in June 1999, following a graded approach. Table 2-1 presents a review of the current safety basis in comparison to the governing DOE Standard.

As previously done in HNF-2896, the *Safety Assessment for Solid Waste Treatment Facility Fuel Removal Project* (HNF-6459) will include the following contents:

- **An** introductory chapter
- Specific information covering the discussion topics specified in DOE-STD-3009-94 for the following SAR chapters for PWR-2 blanket fuel assembly removal activities
 - Chapter 2, *Facility Description*
 - Chapter 3, *Hazard and Accident Analysis*
 - Chapter 4, *Safety Structures, Systems, and Components*
 - Chapter 5, *Derivation & Technical Safety Requirements*

- Appendices as required, including the Preliminary Hazards Analysis (PHA), if not released as a supporting document, and any supporting calculations

The information provided in the safety assessment (HNF-6459) includes additional (i.e., new) information as well as necessary changes to the existing discussions in current safety basis documentation. It also discusses any programmatic changes that are driven by the new activity (i.e., information normally found in SAR Chapters 6 through 17 as specified in DOE-STD-3009-94)

With the exception of changes to Appendices D and F, specific page changes to the ISB generally will direct the ~~user~~ to the safety assessment for PWR-2 blanket ~~fuel~~ assembly removal activities (HNF-6459). Specific page changes will be also be made to the IOSR as applicable.

2.6 Format And Content of the Amendment and Upgrade to the T Plant IOSR Document

The proposed amendment and upgrade to the T Plant IOSR will follow the content requirements of DOE Order 5480.22 using the format of HNF-PRO-700, *Safety Analysis and Technical Safety Requirements*.

1.0 Use and Application - This section defines terms, operating modes, frequency notations, and actions to be taken in the event of a violation to the IOSR.

No changes to this chapter are anticipated

2.0 Safety Limits - This section lists limits on process variables associated with potential barrier failure. There are currently no safety limits for the T Plant.

An amendment to this chapter may result from results of the safety analyses performed and the Hazard Categorization analysis (e.g. limit the number of PWR-2 fuel assemblies at a given time to minimize material at risk, etc.).

No safety limits are anticipated to be required for the 221-T Building after fuel removal and fuel pool D&D activities are completed.

3.0 Limit Conditions for Operation - This section lists limiting control settings, and limiting conditions for operation that define the minimum controls for safe operation of the T Plant.

For the proposed amendment to the IOSR, this section will include any requirements identified by the additional hazards analyses discussed above (see Section 2.1). For the upgrade to the IOSR, appropriate changes will be made to the applicability statements for each operational limit/surveillance requirement to reflect the expected end-state of the 221-T building once the fuel removal and fuel pool D&D activities are completed

4.0 Surveillance Requirements - This section contains the requirements related to test, calibration, or inspection to ensure the necessary operability of safety class **SSCs**.

For the proposed amendment to the IOSR, this section will include any requirements identified by the additional hazards analyses discussed above (see Section 2.1) and will contain the requirements necessary to maintain operation of the facility within the Limiting Conditions for Operation derived from the safety analyses performed. For the upgrade to the IOSR, appropriate changes will be made to the applicability statements for each surveillance requirement to reflect the expected end-state of the 221-T building once the fuel removal and fuel pool D&D activities are completed.

5.0 Administrative Controls - This section contains provisions relating to organizational and management systems necessary to ensure safe operation of the facility as defined in the T Plant ISB and IOSR.

For the proposed amendment to the IOSR, this section will include any requirements identified by the additional hazards analyses discussed above (see Section 2.1) and will contain the administrative controls necessary to maintain operation of the facility within the Limiting Conditions for Operation derived from the safety analyses performed. For the upgrade to the IOSR, appropriate changes will be made to the applicability statements for each administrative control to reflect the expected end-state of the 221-T building once the fuel removal and fuel pool D&D activities are completed.

The current T Plant IOSR contains two appendices.

Appendix A – Design Features - provides a summary of the technical bases for the requirements presented in the IOSR based on the safety analysis.

Appendix A will be amended and upgraded as needed to support changes to the IOSR resulting from the additional safety analyses performed and the expected end-state of the 221-T building.

Appendix B - Bases - defines IOSR violations and provides guidance on actions to take in the event an IOSR is exceeded.

The amendment to the ISB will provide the bases, during the fuel removal and fuel pool D&D activities, for each additional or modified safety limit, LCO, surveillance requirement, and administrative control as required by DOE 5480.22. The upgrade to the ISB will provide the bases for any modified safety limit, LCO, surveillance requirement, and administrative control.

2.7 Schedule

The safety assessment and revisions to current safety basis documents for T Plant are projected to be completed and approved by FH by August 31, 2000. Key interim milestones and their projected completion dates are found in Table 2-2.

Table 2-2. Projected Schedule for T Plant Safety Basis And Readiness Activities

Task Name	Projected Completion Date
Issue Solid Waste Treatment Facility Fuel Removal Project Execution Plan	<i>TBD</i>
Issue Solid Waste Treatment Facility Fuel Removal Preliminary Hazards Identification and Assessment	<i>08/07/00</i>
WMP issue revised criticality safety evaluation report	<i>07/31/00</i>
Modify SARP for the Shippingport Spent Fuel Container used with the Multi-Canister Overpack shipping cask and transporter	<i>TBD</i>
RL approve SARP	<i>TBD</i>
Complete safety assessment and update to the ISB and IOSR	<i>08/17/00</i>
SRB review and approve safety basis changes	<i>08/24/00</i>
FH submit safety basis update to RL	<i>08/31/00</i>
RL approve safety basis update and transmit SER	<i>10/31/00</i>
WMP issue safety basis update	<i>01/02/01</i>
WMP complete training	<i>TBD</i>
Complete readiness review	<i>TBD</i>
RL approve startup	<i>TBD</i>
Implement remaining safety basis changes	<i>TBD</i>
Initiate operations	<i>TBD</i>
Terminate operations	<i>TBD</i>

3.0 SCOPE OF OPERATIONS/ACTIVITIES COVERED

The proposed amendment and upgrade of the T Plant Safety Basis will cover the fuel removal and the fuel pool D&D activities.

3.1 Life Cycle Planning

The Fuel Removal Project consists of three main phases, Planning/Design/Equipment Procurement and Installation, Operations, and Decontamination and Decommissioning, as described in the following sections.

3.1.1 Planning/Design/Equipment Procurement and Installation Phase

The planning/design/equipment procurement and installation phase consists of activities that provide project planning and definition to accomplish the Fuel Removal Project mission during the subsequent fuel removal and D&D phases. System modifications and new equipment installations will also be performed in the 221-T canyon and tunnel during this period. The SNF Project organization will also be performing equipment design and procurement for the SSFCs, the cask, cask transport, and fuel conditioning skid in parallel with the Solid Waste Treatment Facility activities. Waste Management Project activities include preparation of technical baseline documentation including authorization basis and environmental compliance requirements, design and procurement specifications, and work plans and procedures. System modifications, new equipment installation, and startup testing will be performed followed by operator training and readiness reviews. The Fuel Removal Project schedule and cost baseline will be refined as the technical baseline matures during the planning and design phase.

3.1.2 Operations Phase

The operations phase consists of activities focused on removal of the PWR-2 fuel assemblies from the 221-T facility storage pool in Cell 2R, loading of the assemblies into SSFCs, conditioning of the fuel within the SSFCs, and shipment of the SSFCs via a transporter to the CSB for interim storage. The operations phase will be preceded by a readiness evaluation in accordance with established guidelines and directions. SSFC loading, fuel conditioning, and shipment activities will continue until all of the PWR-2 fuel assemblies have been loaded and transported to the CSB.

3.1.3 Decontamination and Decommissioning Phase

Following PWR-2 fuel assembly removal, a limited D&D of the 221-T facility storage pool and support systems in Cell 2R will be performed. The pool water is expected to be pumped to transportable containers for shipment to the effluent treatment facility (ETF) or another treatment/disposal facility. Also, the pool support systems and the fuel racks are expected to be removed, packaged in appropriate burial boxes, and shipped to the low level waste burial grounds (LLBG) for disposal as low level waste (LLW). D&D activities which are allowed may not be accomplished due to changes in mission or future activities.

3.2 End-State Conditions

The following physical end-states are expected to be achieved by the Fuel Removal Project:

- Removal of all PWR-2 fuel from the 221-T canyon storage pool in Cell 2R.
- Shipment of eighteen SSFCs, loaded with four PWR-2 fuel assemblies each, to the CSB and acceptance for interim storage therein.
- Removal and shipment of the 221-T facility storage pool water in Cell 2R to the **EIF** or another **treatment/disposal** facility.
- Shipment of the 221-T facility storage pool support systems and the fuel racks to Solid Waste Storage and Disposal.

The safety basis documentation will describe the fuel removal activity and reflect changes in building conditions and controls necessary to prevent or mitigate potential hazards. The safety documentation, once this task has been accomplished, will reflect the above permitted end-state conditions of 221-T. **Also**, T Plant is expected to allow remaining categorized as Hazard Category 3 when the end-state of the fuel removal and the fuel pool D&D are accomplished; however, consideration of future missions may make it expedient to raise allowable facility inventory limits for other operations or segments above Hazard Category 2 threshold values in conjunction with this change to the authorization basis.

4.0 INTERFACES WITH OTHER FACILITIES/PROJECTS

The Fuel Removal Project system boundary requires physical and programmatic interfaces with existing Hanford Site systems and ongoing Projects and Programs. Interfaces and issues with existing systems will be coordinated and resolved, respectively, by identifying appropriate functional requirements consistent with the existing systems. Interface control with ongoing Projects and Programs will be coordinated with the Project/Program Managers using memorandums of agreement (MOAs), or equivalent. The MOAs will identify and establish the expected interface responsibilities and requirements between projects

4.1 Physical Interfaces

The Fuel Removal Project will have physical interfaces with onsite Hanford Site Utilities (roads, water, sewer, and electrical), the SNF Project facilities and equipment, and the LETF. These physical interfaces are briefly described below.

SNF Project SSFC

The SNF Project will provide SSFCs with internal structures to accommodate the PWR-2 fuel assemblies.

SNF Project SSFC Transport Cask and Transporter

The SNF Project will provide an SSFC transport cask and transporter to transport the fuel from the Solid Waste Treatment Facility to the CSB.

SNF Project MCO SNF Conditioning System

The SNF Project will provide a conditioning system for the PWR-2 fuel assemblies to enable vacuum drying and inerting the SSFC in the 221-T tunnel before shipment.

Hanford Site Roads

The transport of the SSFC cask from the Solid Waste Treatment Facility to the CSB will require using the associated Hanford site access roads.

Canister Storage Building

The CSB will provide storage locations for the 18 SSFCs containing the 72 PWR-2 fuel assemblies.

Low-Level Waste Burial Grounds (LLBG)

The spent fuel pool storage rack and the pool water filtration, cooling, and ion exchange systems is expected to require disposal at the LLBG.

Liquid Effluent Shipping Containers

The Solid Waste Treatment Facility storage pool water is expected to be transported to the **ETF** or other facility for treatment and disposal using liquid effluent shipping containers.

Solid Waste Treatment Facility Utility Systems

The fuel removal equipment will be supplied by existing Solid Waste Treatment Facility utilities systems (steam, water, sewer, and electrical).

Solid Waste Treatment Facility Structure Systems

The fuel removal operations will use the existing 221-T canyon bridge crane system. A new transfer hoist is expected to also be suspended from the existing canyon bridge crane to provide backup if required. Primary fuel assembly grapplers (and secondary grapplers if required) will be designed and procured to function with the existing crane systems. A skid-mounted fuel conditioning system provided by the SNF Project is expected to be located in the 221-T tunnel.

4.2 Programmatic Interfaces

The Solid Waste Treatment Facility Fuel Removal Project will have programmatic interfaces with several other Hanford Site projects to enable transfer of the PWR-2 fuel assemblies to the CSB. Ownership of the PWR-2 fuel assemblies will be transferred to the SNF Project when each loaded SSFC is removed from the 221-T tunnel. Other programmatic interfaces are necessary to effect removal and disposition of 221-T storage pool water, the fuel racks, and the pool water support systems. The following are brief discussions of these programmatic interfaces.

Solid Waste Treatment Facility

The Waste Management Project (WMP) Treatment Facility provides personnel resources needed to accomplish PWR-2 fuel handling operations in the 221-T canyon and tunnel, including the limited storage pool D&D activities. These personnel will also be needed prior to initiation of fuel handling operations for training and qualification and readiness review preparations.

Spent Nuclear Fuels (SNF) Project

The SNF Project is responsible for ensuring that the PWR-2 fuel meets all acceptance criteria for transportation, receipt, and interim storage of the fuel at the CSB when removed from the Solid Waste Treatment Facility canyon.

DOE-RL Authorization Basis Division

Authorization Basis Division (RL-ABD) has responsibility for review of safety basis documents and revisions, and for recommending changes or approval to the program office. For this revision, RL-ABD will review the fuel removal safety assessment, ISB, and IOSR, and recommend approval to the RL-WMD.

DOE-RL Waste Management Division

Waste Management Division (RL-WMD) has field responsibility for the Waste Management Project activities including those conducted at the Solid Waste Treatment Facility. The Program Manager assigned to the Solid Waste Treatment Facility activities will provide input to, and approval authority over, interface agreements for the transfer of

SNF in the custody of the Waste Management Project to DOE-RL Office of Spent Nuclear Fuels Project (**RL-SFO**).

DOE-RL Office of Spent Nuclear Fuels Project (SFO)

The **RL-SFO** has field responsibility for the SNF Project activities. The DOE-RL Waste Management Program Manager will ensure interface agreements are in place for the transfer of **SNF** in the custody of the Waste Management Project to **RL-SFO**.

Solid Waste Storage and Disposal

Following removal of all fuel assemblies from the Solid Waste Treatment Facility fuel pool, it is expected the fuel racks and pool water cooling, filtration, and ion exchange systems will be dismantled, size reduced (if required), and shipped to the LLBG for disposal. The Solid Waste Storage and Disposal organization and the Waste Services organization establish the acceptance criteria for disposal of LLW. The fuel racks and pool water support system equipment are expected to be classified as LLW. After review of the characterization data for the equipment to be disposed of, each disposal container will be designated/classified. The Solid Waste Storage and Disposal and Waste Services organizations will review disposal records and characterization data for completeness prior to authorizing transport of the waste containers to the burial grounds.

Effluent Treatment Facility (ETF)

After fuel removal activities have been completed, contaminated pool water is expected to be pumped to liquid waste transport containers for shipment to ETF (or another treatment/disposal facility) for treatment and disposal. The ETF (or another treatment/disposal facility) will provide acceptance criteria for the pool water.

Other External Programs and Agencies

The Fuel Removal Project management staff will communicate with DOE-RL to discuss project planning and status, and provide periodic reports. DOE-RL will provide funding and authorization to perform work to the project management staff. DOE-RL will be responsible for direct interfaces with external programs and agencies [e.g., Washington State Department of Ecology (Ecology), Nuclear Regulatory Commission (NRC), U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), and the Washington State Department of Health (DOH)].

5.0 ASSUMPTIONS AND AGREEMENTS

The following assumptions and agreements are expected to be used in the development of the T Plant Safety Basis Document update:

1. The frequency and consequences of each accident analyzed in the safety assessment will be used in the selection of Safety SSCs and development of the IOSR. The safety assessment will follow the evaluation guidelines provided in DOE-STD-3009-94, Appendix A. This appendix specifies the numerical radiological dose value (25 rem total effective dose equivalent) that will be used to identify safety class Systems, Structures, and Components. Although results will be provided for standard distances (including the site boundary, State Route 240, and the nearest normally occupied facility), dose consequences will be compared with the general emergency classification criteria for an unmitigated release provided in DOE/RL-94-02, *Hanford Emergency Management Plan*, to determine the need for mitigation of potential releases. The general emergency classification criteria are 1 rem total effective dose equivalent for radionuclide releases and Emergency Response Planning Guideline Level (ERPG)-2 for chemical releases. These criteria are applied at the site boundary. The emergency planning site boundary for the purpose of comparing consequence calculations with the General Emergency classification criteria for potential releases from T Plant is defined as the near bank of the Columbia River (an effective distance of 8.98 kilometers). A waiver to the requirements of HNF-PRO-704, *Hazard and Accident Analysis Process*, will be obtained if needed.
2. Meteorological assumptions and γ/Q 's from WHC-SD-WM-CN-026 and HNF-SD-WM-CN-109 will be used for consistency.
3. RL will review the document in accordance with DOE-STD-1104.
4. The PWR-2 fuel assemblies will be transported to CSB before they cease to be self-protecting in year 2004.
5. Video inspection of the fuel assemblies will be performed during removal for confirmation of assembly condition and dimensions.
6. Actual dose rate measurements of the PWR-2 fuel assemblies present in the Solid Waste Treatment Facility storage pool will be made to confirm calculated values.
7. The SSFCs, cask, and cask transporter will be provided by the **SNF** Project to enable the Solid Waste Treatment Facility to transfer the PWR-2 fuel assemblies within schedule constraints. The **SNF** Project will be responsible for development of a Topical Safety Analysis Report for Packaging (SARP) and an NRC certificate of compliance (if required) for the transport system for transport of the PWR-2 fuel assemblies to the CSB.
8. **SNF** Project will design, fabricate, test, and dismantle a fuel conditioning system expected to be located in the 221-T tunnel. The system design will be based on a

detailed calculation of the actual volume of water holdup per fuel assembly. Solid Waste Treatment Facility personnel will operate the system.

9. The final CSB acceptance criteria is assumed to be consistent with design details provided by the **SNF** Project which allow for four PWR-2 fuel assemblies in an SSFC with **34** kCi/PWR-2 assembly, **3600** kg (8000 lb.) filled SSFC weight. Hazard and accident analyses performed by the SNF Project will show that the PWR-2 fuel assemblies are within the safety analysis envelope established for the CSB.
10. Hazard and accident analyses will provide data to bound air emission hazards. The Solid Waste Treatment Facility Environmental Compliance Officer (ECO) will determine if a Notice of Construction (NOC) must be submitted to the EPA or Ecology.
11. The Solid Waste Treatment Facility **SNF** transfer to the CSB will not compromise the schedule commitments for removal of K Basin SNF.
12. The **SNF** Project will be responsible for final disposition of the PWR-2 fuel assemblies after receipt at the CSB.
13. It is assumed that there will be a remote ungrappling system available for the handling of the SSFCs.
14. Hazard and accident analyses will show that the PWR-2 blanket fuel assemblies cannot assume a critical condition and that the current or revised MCO safety analyses covering packaging and transportation are bounding for these activities

6.0 REFERENCES

- DOE Order 5480.22, *Technical Safety Requirement*, U. S. Department of Energy, Washington, D.C.
- DOE Order 5480.23, *Nuclear Safety Analysis Report*, U. S. Department of Energy, Washington, D.C.
- DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with the DOE Order 5480.23, Nuclear Safety Analysis Reports*, U. S. Department of Energy, Washington, D.C.
- DOE-STD-1104-96, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*, Department of Energy, Washington, D.C.
- DOE-STD-3009-94, *Preparation Guide for US. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, Change 1, U.S. Department of Energy, Washington, D.C.
- DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans*, U.S. Department of Energy, Washington, D.C.
- FDH 1999, *Implementation Plan for DOE Order 5480.22 and DOE Order 5480.23*, letter, R. D. Hanson, FDH, to K.A. Klein, RL, FDH-9955894A R2, dated September 22, 1999.
- HNF-2896, *Safety Assessment for Project W-259*, Waste Management Federal Services of Hanford, Inc., Richland, WA.
- HNF-4922, CSER 78-001 Rev 1: *Criticality Safety Analysis Report for PWR Core 2 Blanket Fuel Storage Cell 4, 221-T Building*, Fluor Federal Services, Richland, WA.
- HNF-6459, *Safety Assessment for Solid Waste Treatment Facility Fuel Removal Project*, Draft, Fluor Hanford, Richland, WA.
- HNF-PRO-700, *Safety Analysis and Technical Safety Requirements*, Fluor Hanford, Richland, WA.
- HNF-PRO-704, *Hazard and Accident Analysis Process*, Fluor Hanford, Richland, WA.
- HNF-PRO-705, *Safety Basis Planning, Documentation, Review, and Approval*, Fluor Hanford, Richland, WA.
- HNF-SD-MP-SRID-011, *Waste Management Hanford Standards/Requirements Identification Document*, Rev. 1, Fluor Daniel Hanford, Richland, WA
- HNF-SD-SNF-TI-061, *Shippingport Pressurized Water Reactor Core 2 Blanket Assemblies Source Term Calculations Using ORIGEN2*, Rev. 1, Fluor Daniel Northwest, Richland, WA.

HNF-SD-WM-CN-109, *Determination of χ/Q 's for Solid Waste Facility MSAR*, Rev. 0, Waste Management Federal Services of Hanford, Inc., Richland, WA.

HNF-SD-WM-ISB-006, *Interim Safety Basis for Solid Waste Facilities (T Plant)*, Rev. 1B, Fluor Hanford, Richland, WA.

HNF-SD-WM-MSAR-001, *Solid Waste Facilities Master Safety Analysis Report (MSAR)*, Draft, Fluor Hanford, Richland, WA.

HNF-SD-WM-TSR-003, *T Plant Interim Operational Safety Requirements*, Rev1, Waste Management Federal Services of Hanford, Inc., Richland, WA.

RHO-CD-356, *Safety Assessment Document – PWR Core 2 Project*, Rockwell Hanford Operations, Richland, WA.

RHO-CD-423, *PWR Core 2 Operations Safety Requirements*, Rockwell Hanford Operations, Richland, WA.

WHC-SD-SQA-CSA-20104, CSER 86-007, *T Plant Decontamination and Repair Facility*, Rev. 0, Westinghouse Hanford Company, Richland, WA.

WHC-SD-WM-CN-026, *Atmospheric Dispersion Factors for T Plant Complex*, Rev. 0, Westinghouse Hanford Company, Richland, WA.

7.0 ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
CD	Criteria Document
CSB	Canister Storage Building
D&D	Decontamination and Decommissioning
DOE	U. S. Department of Energy
DOH	Washington State Department of Health
DOE-RL	U.S. Department of Energy, Richland Operations Office
ECO	Environmental Compliance Officer
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ETF	Effluent Treatment Facility
FH	Fluor Hanford
HNF	Hanford
IOSR	Interim Operational Safety Requirement
ISB	Interim Safety Basis
LCO	Limiting Conditions for Operation
LLBG	Low-Level Burial Grounds
LLW	Low Level Waste
MCO	Multi-Canister Overpack
WMP	Waste Management Project
MOA	Memorandum of Agreement
MSAR	Master Safety Analysis Report
N/A	Not Applicable
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PHA	Preliminary Hazard Analysis
PHMC	Project Hanford Management Contract
PWR	Pressurized Water Reactor
RHO	Rockwell Hanford Operations
RL-SFD	DOE-RL Spent Fuel Division
RL-WPD	DOE-RL Waste Program Division
SAR	Safety Analysis Report
SARP	Safety Analysis Report for Packaging
SRB	Safety Review Board
SSC	Structures, Systems, and Components
SNF	Spent Nuclear Fuel
SSFC	Shippingport Spent Fuel Container
TBD	To Be Determined
TSR	Technical Safety Requirement
WHC	Westinghouse Hanford Company

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