May 2, 2011

Independent Review Report
Idaho National Laboratory
Fuel Conditioning Facility
Safety Basis Review Follow-up

PURPOSE

The purpose of this follow-up review was to verify how and to what extent Idaho National Laboratory (INL) addressed the Significant Issues that were identified in the April 2010 Independent Oversight report on the INL Fuel Conditioning Facility (FCF) safety basis review, as well as the consideration given to the recommendations that were made. Significant Issues were defined in that report as problems or concerns that affected the validity of the FCF safety basis documentation. The Office of Health, Safety and Security (HSS) fulfilled this objective by reviewing the draft Safety Analysis Report (SAR) for the FCF, technical safety requirements (TSRs), and supporting documentation revisions.

This report discusses the background, scope, results, and conclusions of the follow-up review, as well as items for further follow-up by HSS. Appendix A provides a table of the Significant Issues and associated recommendations from the 2010 report, the proposed INL resolution of these issues, and Independent Oversight's comments. Appendix B lists the documents that HSS reviewed. The follow-up review was conducted from March 21 to April 6, 2011.

BACKGROUND

In 2010, HSS conducted an independent review of the upgraded INL FCF safety basis at the request of the U.S. Department of Energy (DOE) Office of Nuclear Energy (NE) and the DOE Idaho Operations Office (DOE-ID). The independent review, which was performed in parallel with the DOE line management review, focused on selected aspects of the upgraded safety basis. The conduct of the review was based on the requirements of 10 CFR 830, *Nuclear Safety Management*, and DOE technical standards, including DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses*, and DOE-STD-1104, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*. The independent review focused on the following approval basis areas:

- Hazard and accident analyses
- Safety structures, systems and components (SSCs)
- Specific administrative controls (SACs)
- Derivation of TSRs, including SACs
- Attributes for criticality safety.

The 2010 independent review also evaluated selected hazard controls contained in the SAR to determine whether they were correctly translated into the TSRs. During the course of the review, Significant Issues were documented to clearly and concisely describe the issue and to provide an explanation of the significance of the issue. As they were identified, these issues were communicated to and discussed with NE, DOE-ID, and the INL contractor, Battelle Energy Alliance (BEA), to ensure that they received timely resolution. These Significant Issues were captured in the HSS Independent Oversight report entitled, *Independent Oversight Review of the Idaho National Laboratory Fuel Conditioning Facility*, dated April 2010. This report also provided recommendations for line management's consideration in addressing each Significant Issue.

SCOPE

The scope of this followup review activity included evaluation of the draft SAR and TSR as submitted by INL for review and approval by DOE-ID, as well as the supporting safety basis documentation and analyses. This review focused on determining whether the revised FCF SAR, TSR, and supporting documentation adequately addressed the four Significant Issues raised during the HSS review of this information as documented in the April 2010 report, *Independent Oversight Review of the Idaho National Laboratory Fuel Conditioning Facility Safety Basis*. The four Significant Issues addressed the: 1) analysis of cadmium releases in seismic events, 2) analysis of radiological releases following an evaluation basis earthquake (EBE), 3) integration of the results of the Fire Hazards Analysis (FHA) for MFC-765 Fuel Conditioning Facility with the SAR analysis, and 4) protection of SAR assumptions with appropriate TSR controls.

RESULTS

In response to the comments and recommendations provided by Independent Oversight and DOE-ID, INL made significant revisions to the FCF SAR and TSRs. INL developed a technical evaluation (TEV) to provide an expanded discussion of each of the accident scenarios in the SAR, including accident progression and associated assumptions. The TEV discusses the cadmium events and EBE, which were specifically identified in the Significant Issues as needing enhancement.

Review of Response to Significant Issue 1: Cadmium Releases

To address the Significant Issue dealing with cadmium releases, INL developed a detailed engineering calculation and analysis report (ECAR) to cover the scenarios involving the potential release of cadmium. The ECAR includes analysis of the spill of cadmium during an EBE, as well as an analysis of the involvement of cadmium in the resulting pyrophoric fire. For a spill, the ECAR identifies the effect on the facility worker, collocated worker, and public as moderate, low, and negligible, respectively. Also, two new controls are identified to protect the facility worker: the argon cell confinement system and boundary leak rate test. In addition, selected defense-in-depth features include the safety exhaust system (SES) and process equipment design. The spill event description and controls have been added to the revised SAR and TSR. For the EBE, the ECAR estimates the effect on the facility worker, collocated worker, and public as high, moderate, and low, respectively. An EBE event involving the cadmium in the pyrophoric fire was judged by INL to be extremely unlikely; therefore, no controls are required in accordance with INL guidance documents.

The INL actions, including the added controls for the cadmium spill event (SAR accident), appropriately address the concerns identified in the Significant Issue regarding cadmium events.

Review of Response to Significant Issue 2: Evaluation Basis Earthquake Event

The second Significant Issue related to the EBE event and included several elements, including input parameters to the analysis, consideration of two-over-one interactions for the confinement structure, estimates for egress times by facility workers, and discussion of the residual risk in the SAR. To address this issue, INL prepared new calculations for the EBE source term and dose consequences for both mitigated and unmitigated cases. ECAR-1226, *Fuel Conditioning Facility Documented Safety Analysis Upgrade Radioactive Source Term Data*, was developed to update the source term data and provide a detailed description of the segmented source term contributors in the argon cell. In addition, ECAR-307, *FCF DSA Upgrade Design Basis Accident Dose Consequence Analysis*, which calculated the dose consequences, was revised to reflect the newly developed argon cell source term and include both

mitigated and unmitigated consequences for the EBE.

Although the source term calculations and underlying assumptions are mostly accurate, two weaknesses were noted. First, the airborne release fraction (ARF) and respirable fraction (RF) selected for plutonium and other actinides (see ECAR-307, Rev. 1, Table 12) are not consistent with those chosen for uranium and fission activation products, and this inconsistency is not explained. Second, the discussion of the selected damage ratio for the mitigated event is not sufficient to fully explain the rationale for the choice or the importance of the various structures and components to the facility safety basis. Because preliminary estimates indicate that the dose consequence to the facility worker is very sensitive to ARF, RF, and damage ratio changes, and because increases in these values could lead to unacceptable dose consequences, these weaknesses should be evaluated further.

An additional element of this second Significant Issue related to the potential for two-over-one interactions. In response, INL revised its evaluation to clarify the discussion of two-over-one interactions. TEV-354, *List of Structural Analyses Completed as Part of the FCF Upgrades Project at MFC*, discusses in detail the structural analyses performed for the facility and the walkdowns conducted to examine the structures and systems. TEV-354 also describes the two-over-one analyses and evaluations that have been performed, including analyses of the argon cell crane and electromechanical manipulators, and references other analyses completed for components in the argon cell. In particular, the evaluation discusses the seismic status of the hot repair area on the FCF roof. Although the discussion in the evaluation is thorough and summarizes a large body of evidence relating to the seismic qualifications of the facility, it does not indicate whether all the actions to address the issues related to the qualification of the facility were completed (e.g., analysis of the shear capacity of the cell foundation) and the remaining open actions, if any, that might impact the current SAR. SAR Section 3.3.2.3.9, *Planned Design and Operational Improvements*, discusses the seismic qualifications of the argon roof cell structures, as developed in TEV-354, and indicates that they do not pose a threat to the safety-significant structures. However, the SAR does not reference the seismic analyses and the capabilities of the facility SSCs in the development of the damage ratio for the mitigated case of the EBE.

The remaining elements of this Significant Issue are adequately resolved by the revised documents. The revised safety analysis discusses facility worker safety and establishes controls to mitigate dose. However, as allowed by NS-18104, *INL Guide to Safety Analysis Methodology*, the revised safety analysis does not calculate the dose consequence to the facility worker; therefore, it was not necessary to perform the life safety egress calculation. Also, the discussions of the accident scenarios have been revised to include the remaining risk for the mitigated case for each of the events. For example, the residual risk for the EBE is estimated to be moderate for the facility worker, low for the co-located worker, and negligible for the public. Finally, although the SES has not been added as a safety-significant system, it has been identified as providing defense-in-depth, and a number of additional controls have been identified to address the EBE event. These include administrative controls on the amounts of material at risk in the argon cell, designation of the argon cell confinement system as a design feature, and development of a confinement leak rate test with associated acceptance criteria.

Review of Response to Significant Issue 3: Integration of Fire Hazards Analysis into SAR

The third Significant Issue identified two instances in which the FHA, HAD-438, Rev. 0, and SAR were not sufficiently integrated. Although the documents were revised to establish consistency, some inconsistencies remain.

In the first instance, the FHA indicates that structural steel failure, including crane failure, could occur during a pool fire resulting from a spill of transporter fuel. Three sections of the SAR discuss scenarios that could be affected by this fire event. Two of the scenarios, cask breach and loss of air cell

confinement, consider the pool fire as a potential cause of the event, while the third scenario specifically addresses a pool fire in the fuel cask handling area. Although discussions of the scenarios involve some of the potential consequences of the pool fire, the potential changes in release fractions or damage ratio that might result from the combination of crane failure, cask breach, and fire are not addressed.

In the second instance, the categories of pyrophoric fires in the argon cell discussed in the SAR do not fully match those analyzed in the FHA; the analyzed fire duration in the FHA is 20 minutes, while the SAR indicates that the pyrophoric fire duration is approximately 30 minutes. INL personnel clarified that the FHA examines the potential for filter plugging and flashover using a conservative time of 20 minutes for a pyrophoric fire. The analysis of pyrophoric fires in the argon cell has been substantially revised for the latest version of the SAR; however, some differences between the fires considered in the accident analysis and in the FHA remain. For example, the SAR hazard analysis continues to discuss two categories of pyrophoric fires. The first category is a fire such as that postulated in the FHA (a pyrophoric fire that involves the optical oil from a single window; SAR Table 3-9, Event No. 1.5), while the second category considers pyrophoric fires resulting from loss of argon confinement. Although the hazard analysis discusses a pyrophoric fire involving window oil, the two accident analyses involving pyrophoric fires do not involve spilled oil from the viewing windows and do not explain the omission.

Review of Response to Significant Issue 4: Controls for SAR Assumptions

The fourth Significant Issue documented a number of concerns with the incorporation of controls to protect the assumptions made in the hazard and accident analyses. Overall, the revisions to the SAR and TSR address the assumptions in the hazard and accident analyses and largely resolve the items that were raised in the Significant Issue.

The HSS review of the TSR controls resulted in three observations. First, the quantity of plutonium allowed in the Mk V Electrorefiner by SAC 5.403.2 appears to be significantly less (by about 30%) than that allowed by SAC 5.403.1; this situation may restrict operations more than intended. Second, since the equipment transfer lock (ETL) lift height requirement was not elevated to a TSR requirement, consideration should be given to making transfers through the ETL while the facility is in Standby mode. This change would reduce the exposure of pyrophoric material at a time when there are significantly fewer barriers to an event (see SAR Table 3-9, Event No. 1.8). Third, in some instances where a programmatic administrative control is specifically credited as a control, consideration should be given to describing the specific control that is needed.

CONCLUSIONS

The revisions INL made to the SAR, TSR, and supporting documents appropriately address the Significant Issues identified by Independent Oversight and resolve most of the underlying concerns. INL prepared a new document to describe the accident scenarios, developed a significant new calculation to address cadmium releases, substantially revised the source term and consequence analyses for the pyrophoric fires resulting from loss of argon confinement, and revised the TSRs to more closely capture the assumptions made in the analyses. Nonetheless, some of the weaknesses in safety basis documentation that were identified in the April 2010 Independent Oversight report have not been fully addressed. Seismic qualifications of the facility SSCs, which are critical to the choice of the damage ratio in the EBE, are not discussed sufficiently in the SAR to establish their importance to the safety basis of the facility. Further, additional revisions to the SAR and FHA are necessary to ensure that these documents are appropriately integrated. Also, HSS recommends that a commitment be made to ensure the operability of the defense-in-depth SES by incorporating it into the FCF maintenance program. Addressing these weaknesses would enhance the discussion of key details regarding facility design while

strengthening the FCF safety basis and the understanding thereof.

ITEMS FOR HSS FOLLOW-UP

The following were identified as weaknesses in the upgraded safety basis: 1) the relation of the seismic qualifications of critical SSCs to the selection of damage ratios when calculating the mitigated accident source terms, 2) inconsistencies between the FHA and SAR discussions of the postulated fires in the facility, and 3) the incorporation of the defense-in-depth SES into the FCF maintenance program. To assist in addressing these weaknesses, HSS will follow up to verify that NE, DOE-ID, and BEA take actions as appropriate to improve the safety basis documentation and that steps are taken to ensure the continued operability of the SES, which is relied upon for defense-in-depth.

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APPENDICES

Appendix A – Significant Issue Review Summary
Appendix B – Documents Reviewed

Appendix A
Significant Issue Review Summary

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
1	Potential accidents and release path mechanisms involving elemental cadmium during seismic events are not adequately analyzed. – Fully analyze the effects of a seismic event causing a cadmium spill, including the effects of worst case splashing and spontaneous combustion within the cell and the effects of a simultaneous pyrophoric fire interacting with the cadmium spill.	TEV-978, "SAR-403 Accident Analysis Scenario Development," was prepared and referenced in Chapter 3. TEV-978 addresses scenario development for the analyzed accidents contained in Chapter 3 of SAR-403. Subsequently, ECAR-292, "Cadmium Toxicological Exposure Evaluation for the Materials and Fuels Complex (MFC) Fuel Conditioning Facility (FCF)," was revised to include thermal analysis of burning uranium interacting with spilled cadmium, and the potential consequences were calculated. Chapters 3, 4, 5, and TSRs were revised accordingly.	TEV-978 provides an expanded discussion of the scenarios analyzed in SAR-403. The bounding event is identified as a release of cadmium resulting from an EBE. Since it involves the largest amount of material and loss of confinement, this event is considered bounding for the load drop accident as well as a fire involving the cadmium stored outside the argon cell. ECAR-292 includes a separate scenario addressing the impact of a pyrophoric fire on the cadmium release. It has been revised to include a lengthy, detailed analysis of the spill of cadmium during an EBE, including involvement of cadmium in the resulting pyrophoric fire. The analysis addresses the effects of splashing and spontaneous combustion. For a spill, ECAR-292 calculates the effects on the facility worker, collocated worker, and the public as moderate, low, and negligible, respectively. For the EBE, ECAR-292 calculates the effects on the facility worker, collocated worker, and the public as high, moderate, and low, respectively. For the spill event, two (new) controls are identified to protect the facility worker: the argon cell confinement system and boundary leak rate test. In addition, defense-in-depth features include the SES and process equipment design. For the EBE, the event is judged to be extremely unlikely; no controls are required (by INL documents) in this case and none are assigned for this event. The added controls for the spill event (analyzed accident) are likely sufficient.
2	The analysis of the postulated EBE in SAR-403 does not adequately develop the scenario and the release source term, and does not appropriately justify the controls selected to mitigate	TEV-978, "SAR-403 Accident Analysis Scenario Development," was prepared and referenced in Chapter 3. TEV-978 addresses scenario development for the analyzed	As described in the INL response, a separate document was prepared to describe scenario development in more detail, and new calculations were prepared for the EBE source term and dose consequence for both mitigated and unmitigated cases. A number of additional controls have been identified to address this event, including controls on the amounts of material at risk (MAR) in the argon cell as well as

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
	the consequences of the event – Reanalyze the EBE accident using reasonably conservative, applicable estimates of input parameters, specifically ARF and RF, and considering the possibility that system operations may exacerbate conditions at the time of the event. Based on the results of the reanalysis (including both radiological and chemical releases), re-evaluate and justify the classification of SSCs taking into account the need for multiple barriers to release and defense-in-depth, including the possibility of designating the SES as a credited system.	accidents contained in Chapter 3 of SAR-403. Subsequently, ECAR-1226, "Fuel Conditioning Facility Documented Safety Analysis Upgrade Radioactive Source Term Data," was issued and ECAR-307, "FCF DSA Upgrade Design Basis Accident Dose Consequence Analysis," was revised to include better justification of newly selected airborne release fractions and respirable fractions. The ECAR-307 revision also segregated dose from material constituents to allow better understanding of the dose contributors. The worker dose estimate discussion was also revised to eliminate confusion regarding stay time and enhance the residual risk discussion. TEV-354, "List of Structural Analyses Complete as Part of the FCF Upgrades Project at MFC," was revised to better address two-over-one conclusions. Chapters 3, 4, and 5 and TSRs were revised accordingly.	the argon cell confinement system. As documented in the INL response, TEV-978 was developed to expand the discussion of the accident scenarios. ECAR-1226 was developed to update the source term data and provide detailed description of the segmented source term contributors in the argon cell. Finally, ECAR-307 was revised to obtain the dose consequences for accidents affecting the revised argon cell source term, including both mitigated and unmitigated analysis of the EBE. Two weaknesses in the assumptions in ECAR-307 were noted. The first is that the ARF and RF selected for plutonium and other actinides (see ECAR-307, Rev. 1, Table 12) are not consistent with those chosen for uranium and fission activation products. The former were chosen for "oxidation at greater than room temperature but less than self-sustained oxidation," while the latter were chosen for "self-sustained oxidation with self-induced convection." Without further explanation, the conditions that apply to the uranium and fission products would appear to apply equally to the plutonium and actinide products. Under these conditions, a consistent pair of ARF and RF values for the plutonium and actinides would be 5.0 E-4 and 0.5, respectively. These values would increase the mitigated dose rate to the facility worker by ~5 rem/min and the mitigated dose to the co-located worker by ~1 rem, which would not significantly alter the results currently presented in the SAR. The second weakness is that the selection of a damage ratio of 0.1 in ECAR-307 and the SAR is not sufficiently justified in the discussion of the mitigated case. For example, the analysis does not discuss the ability of the crane and electromechanical manipulators (EMMs) to survive the EBE or the methods of storing the cladding hulls and stored salts. Increases to the damage ratio (such as doubling to 0.2) can lead to unacceptable dose rates to the facility worker (i.e., dose rates greater than approximately 100 rem/min).

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
2	– Two-over-one analyses should be documented for the confinement structures, and should be described in the SAR, in order to assure that the scenario is accurate, credit for cell structures is valid, and the analyzed prevention and mitigation strategies are adequate.		TEV-354 summarizes in detail the structural analyses performed for the facility and walkdowns performed to examine the structures and systems. It also discusses the two-over-one analyses and evaluations that have been performed, including analyses of the argon cell crane and EMMs. The report also indicates that other analyses have been completed for components in the argon cell. In particular, the evaluation discusses the seismic status of the hot repair area on the FCF roof; this discussion is also included in Section 3.3.2.3.9 of the SAR. Although the discussion in the evaluation is thorough, it does not indicate whether all the actions to address the issues related to the qualification of the facility were completed (e.g., the shear capacity of the cell foundation) and whether there are any remaining open actions that might impact the current SAR. Section 3.3.2.3.9, *Planned Design and Operational Improvements*, discusses the seismic qualifications of the argon roof cell structures and indicates that they do not pose a threat to the safety-significant structures. It also states that the analysis shows that the argon cell structure and confinement system are safety-significant and thus need to meet PC-2 provisions; however, the analysis in Chapter 3 also shows that the argon cell structure (at a minimum) must meet PC-3 criteria, and the crane and electromechanical manipulators remain in place, in order to limit the damage (ratio) to material in the argon cell during an EBE. Discussion in this section also indicates that the "exit and decontamination cell structures" need to meet PC-2 provisions for two-over-one purposes; however, it does not indicate whether those provisions are actually met.
2	– Perform a life safety egress calculation to validate the evacuation time used in the SAR, and analyze and verify that emergency lighting will be available in the aftermath of the earthquake.		Although the revised safety analysis discusses facility worker safety and establishes controls to mitigate dose, it does not calculate the dose consequence to the facility worker (in accordance with the guidance in NS-18104); therefore, the life safety egress calculation is not necessary and has not been performed. In addition, discussion of the availability of emergency lighting to support facility worker egress is not needed in the safety basis, although it should be considered as part of the life safety code program requirements for

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
			building egress.
2	– Explicitly disclose the residual risk for DOE acceptance of the mitigated consequences of this accident (or any other unlikely category event), since the risk remains in the moderate category for facility workers and thus will not be reduced to meet the INL evaluation guidelines.		The discussions for the accident scenarios have been revised to include the remaining risk for the mitigated cases of each of the events. For the EBE, the residual risk is estimated to be moderate for the facility worker, low for the co-located worker, and negligible for the public. The emergency management program is added as an additional administrative control for mitigating the risk to the facility workers.
2	– Use a more balanced hazard control strategy using active mitigative systems, such as the SES.		To control the hazards associated with operation, INL chose to enhance the inventory control over the forms of material within the argon cell, add limiting conditions of operation to govern the transfer locks, and add additional active systems as defense-in-depth. INL did not change the designation of the SES, even though the discussions in TEV-978 clearly indicate that the SES is a significant contributor to defense-in-depth and reduces the dose consequences for a number of events to acceptable levels of risk.
3	The SAR analysis of fires is not sufficiently coordinated with the analysis in the FHA to consider the full implications of the accidents described. – Evaluate the potential for damage to the cask and breach of the air cell from failure of the overhead crane in a post-flashover condition. Integrate the	A consistency review of the SAR and FHA was conducted, and each document was revised accordingly.	Three sections of the SAR discuss scenarios that could be affected by the fire. Section 3.3.2.3.1.2 of SAR-403, *Fire in Cask Handling Area*, (SAR Table 3-9, Event No. 1.1) discusses the scenario involving a fire in the fuel cask handling area, but the discussion does not address the potential changes that might arise should there be a structural failure caused by the fire. Section 3.3.2.3.2.1, *Cask Breach*, discusses events involving cask breaches (SAR Table 3-9, Event No. 1.1). The discussion considers that the cask drop may be the result of a fire-induced structural failure, but does not address the changes in release fractions or damage ratio that might result from the combination of crane failure, cask breach, and fire. Finally, Section 3.3.2.3.2.2, *Loss of Air Cell Confinement*, considers the loss of

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
	analysis and conclusions in both the FHA and SAR for this fire event.		confinement due to failure of the high bay crane structure in a pool fire involving cask transporter fuel.
3	– Fully evaluate the second category pyrophoric fire in the argon cell in the FHA and re-evaluate the pyrophoric fire scenario analysis in the SAR giving consideration to the FHA data.		HAD-438 Section 5.3.2.10, *Pyrophoric Materials* (page 82), indicates the duration of the fire is 20 minutes based on an old safety analysis. The current safety analysis calculations estimate the pyrophoric fire to be of approximately 30-minute duration. The FHA addresses a pyrophoric fire in the argon cell (assuming a loss of argon atmosphere and ignition) that involves the oil from a single viewing window. The scenario (HAD-438, Rev. 0, Sections 5.3.3.1 and 5.7.1.1) examines the potential for filter plugging and flashover for this scenario and concludes that no filter plugging or flashover occurs. SAR Section 3.3.2.3.1.4, *Fire in Argon Cell*, continues to discuss two categories of pyrophoric fires. The first category is a fire such as that postulated in the FHA (a pyrophoric fire that involves the optical oil from a single window – SAR Table 3-9, Event No. 1.5), while the second category considers pyrophoric fires resulting from loss of argon confinement while pyrophoric material is exposed. Although the pyrophoric fire involving window oil is discussed in the SAR hazard analysis, accident analyses involving pyrophoric fires do not involve spilled oil from the viewing windows (with no explanation). The first accident event is a pyrophoric material fire in the argon cell resulting from loss of argon confinement, and the second accident is the EBE.
4	The assumptions used in the documented safety analysis (DSA) hazard and accident analysis need to be adequately described and protected, as appropriate, to ensure that operations are not inadvertently allowed outside of the FCF	The TSRs were revised to include assumption protections related to material-at-risk quantities. Furthermore, the argon cell confinement leak rate was added as a TSR surveillance. The cask control strategy was	The revisions to the TSRs to address the assumptions in the hazard and accident analyses mostly resolve the items that were raised in the Significant Issue. The quantity of plutonium allowed in the Mk V Electrorefiner by SAC 5.403.2 (see table in SAC 5.403.2 Basis) appears to be significantly less (by approximately 30%) than that allowed by SAC 5.403.1 and may restrict operations more than intended.

Significant Issue	Issues & Recommendations discussed in April 2010 Report	INL Response/Resolution Provided in Draft Revision	Independent Oversight Comments
	safety basis. – Review the assumptions that are fundamental to the accident analyses and identify those assumptions that are critical in defining the safety envelope of the facility. Based on this review, re-evaluate the TSR controls that are necessary to ensure that the facility is operated within the bounds of the analyses.	reviewed to include a TSR-required contractor-approved cask control list (LST-337) that includes configuration requirements. Based on the results from the revision to ECAR-307, "FCF DSA Upgrade Design Basis Accident Dose Consequence Analysis," the ETL lift height requirement was not elevated to a TSR. The cask tunnel access control is an implementation issue rather than a planned modification.	Since the ETL lift height requirement was not elevated to a TSR requirement, consideration should be given to making transfers through the ETL while the facility is in Standby mode. This would reduce the exposure of pyrophoric material at a time when there are significantly fewer barriers to an event (see SAR Table 3-9, Event No. 1.8). In some instances where a programmatic administrative control is added (as a control), consideration should be given to describing the specific control that is needed. For example, the commitment for the emergency management program could include specific procedures to address the response to an earthquake (see also DOE Order 420.1), or the commitment for the hoisting and rigging program could be to identify cask handling or transfers through the ETL as critical lifts.

Appendix B
Documents Reviewed

- SAR-403, Safety Analysis Report for the Fuel Conditioning Facility, Rev. 0
- TSR-403, Technical Safety Requirements for the Fuel Conditioning Facility, Rev. 0
- INL Response to DOE-ID Comments on the Fuel Conditioning Facility SAR-403 and TSR- 403
- TEV-978, SAR-403 Accident Analysis Scenario Development, Rev. 0, 12/20/10
- ECAR-292, Cadmium Toxicological Exposure Evaluation for the Materials and Fuels Complex (MFC) Fuel Conditioning Facility (FCF), Rev. 2, 1/3/11
- ECAR-307, FCF DSA Upgrade Design Basis Accident Dose Consequence Analysis, Rev. 1, 1/3/11
- ECAR-1247, Development of Leak Rate Testing for the FCF Argon Cell, Rev. 0, 11/12/10
- HAD-438, Fire Hazards Analysis MFC-765 Fuel Conditioning Facility (FCF), Rev. 0
- ECAR-1226, Fuel Conditioning Facility Documented Safety Analysis Upgrade Radioactive Source Term Analysis, Rev. 0, 12/16/10
- TEV-354, List of Structural Analyses Complete as Part of the FCF Upgrades Project at MFC, Rev. 1, 12/20/10
- ECAR-315, FCF DSA Upgrade Equipment Malfunction Accident Dose Consequence Analysis, Rev. 0, 9/16/08