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January 17, 2003

Mr. Timothy C. Johnson
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U.S. Nuclear Regulatory Commission
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Reference: **NRC Contract No.** NRC-02-01-002 - Technical Assistance in the Review of Information Submitted to Support Construction Authorization.
Task 1 - Technical Assistance to Review the Mixed Oxide Fuel Fabrication Facility License Application.
Sub-Task 1.A.1 - Review of the Draft Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility.

Dear Mr. Johnson:

Advanced Technologies and Laboratories, International, Inc. (ATL) is pleased to deliver three hard and one electronic copy of the final version of our review of the NRC's April 30, 2002 Draft Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility under the subject contract. ATL has incorporated the comments and recommendations of your letter dated January 6, 2003.

The enclosed CD contains two versions of the report; the first is in WordPerfect Version 8 while the second is an Adobe PDF file. These documents and electronic files complete this sub-task.

As always, we look forward to continuing to provide support services to the NRC. ATL is committed to providing you with the most cost-effective and highest quality technical support. If you have any questions or concerns, please contact me at (301) 515-6794 or via e-mail at MPOrr@ATLintl.com.

Sincerely,

Marquis P. Orr

Marquis P. Orr
Senior Program Manager

NMSS01

Contract No. NRC-02-01-002
Technical Assistance in the Review of Information Submitted to Support Construction Authorization (CA)

Final Report

Review of Draft Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility

January 17, 2003

Prepared for:
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Prepared by:
Advanced Technologies and Laboratories (ATL) International, Inc.
20010 Century Boulevard, Suite 500
Germantown, MD 20874

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INTRODUCTION

On February 28, 2001, the consortium of Duke, Cogema, and Stone & Webster (DCS) submitted a Construction Authorization Request (CAR) as part of its application to build and operate a Mixed Oxide Fuel Fabrication Facility (MFFF) on the U.S. Department of Energy's (DOE) Savannah River Site (SRS) near Aiken, South Carolina. Other documents submitted by DCS in support of its application include an Environmental Report dated December 19, 2000, and a Quality Assurance Plan, Revision 2, dated January 29, 2001. These documents are available at the U.S. Nuclear Regulatory Commission's (NRC) public reading rooms and via the Internet through the NRC's Agency-wide Documents Access and Management System (ADAMS).

Construction of a MFFF will support the DOE's Surplus Plutonium Disposition Program (SPDP), which is part of a bilateral agreement with the Russian Federation. Under the agreement, each nation will dispose of 34,000 kg (37.5 U.S. tons) of weapons-grade plutonium by diluting it and converting it to Mixed Oxide (MOX) fuel for use in commercial nuclear power plants. After irradiation, the remaining plutonium in the spent nuclear fuel would be unuseable for nuclear weapons.

The CAR describes the principal structures, systems, and components (PSSCs) of the proposed MFFF. The NRC performed a review of the CAR and related DCS documents to determine the completeness of the information and the adequacy of the proposed design to comply with the regulatory requirements of 10 CFR Part 70. The NRC applied NUREG-1718 "Standard Review Plan for the Review of an Application for a Mixed Oxide (MOX) Fuel Fabrication Facility," dated August 2000, as a guide to review the CAR and aid in the development of a Draft Safety Evaluation Report (DSER). The DSER documents the NRC's review of the CAR and addresses the regulatory requirements for approval of construction; however, it does not address operational aspects of the facility. Under 10 CFR 70.23(b), the NRC can approve the construction of a plutonium fuel fabrication facility if it finds the design basis of the PSSCs and the Quality Assurance (QA) program provide a reasonable assurance of protection against natural phenomena and the consequences of potential accidents.

The NRC staff completed the review of the CAR and published the DSER on April 30, 2002. They concluded that the CAR and supporting information from DCS did not provide sufficient information to allow the staff to find that the design and QA program for the MFFF would provide "*...a reasonable assurance of protection against natural phenomena and the consequence of potential accidents.*" Consequently, the NRC is withholding construction authorization for the facility until DCS provides additional information and satisfies the open items listed in the DSER. The NRC is planning to issue a revised DSER after the staff receives and reviews any of the additional information provided by DCS.

Advanced Technologies and Laboratories International, Inc. (ATL) was tasked with performing an overall review of the DESR using an unbiased senior expert and staff. The selected senior expert reviewer had over 30 years of plutonium-handling and fuel-fabrication experience, but no involvement in the public or private meetings between the NRC and DCS. The ATL reviewer was given copies of the DSER, CAR, and other publically available documents and requested to review the DSER for (1) areas that the NRC had overlooked or were deserving of additional attention, and (2) areas where the NRC had concerns that may not be fully warranted. The attached table presents the reviewer's comments.

SUMMARY

The ATL staff and expert reviewer identified a number of inconsistencies and areas of concern in the DSER. Most of these issues are minor, but a few do identify potential problem areas for the NRC and DCS. Some of the more important concerns are identified below.

- Storage Time Limit for PuO_2 Powder. One of the reviewer's areas of concern is the lack of a specific limit on the storage time for PuO_2 powder. After aqueous purification, the PuO_2 is stored in reusable PuO_2 storage cans until it is fed into the blending and pelletization process. When this type of PuO_2 powder is stored for too long, the resulting heat and gamma radiation causes a release of the hydrated water and converts it into steam that can rupture the storage can. When this happens, the inside of the storage vault is dusted with PuO_2 powder and the subsequent cleanup costs are enormous. The NRC should verify that controls are in place to limit the amount of time that a storage can of PuO_2 powder would be kept in a storage vault.

- Bounding Accident. Although the NRC staff has determined that a dropped fuel assembly is the bounding accident for load-handling events, the ATL reviewer does not agree. The NRC's decision appears to be based on a report from Sandia National Laboratory (SNL) for the Yucca Mountain Environmental Impact Statement (EIS); however, SNL developed its report for spent nuclear fuel rods, which are very fragile. New fuel is contained in unirradiated zirconium alloy or possibly stainless steel tubes, and these fuel rods are much stronger and harder to break when dropped. ATL believes the true bounding accident for load-handling events is most likely a dissolver tank rupture or jar drop.

- Pyrophoric Metals. The NRC staff is concerned about the pyrophoric nature of finely divided metal or sub-stoichiometric uranium and plutonium oxides, but this should not be a major issue. While it is true that UO_2 can burn and convert to U_3O_8, this is an unusual event with a low probability of occurrence. The blending and pelletization process will occur inside glove boxes under a reduced oxygen atmosphere that should further reduce the probability of a pyrophoric event. ATL recommends that the NRC staff not pursue this issue unless they have specific data to support their position.

- Red Oil Fire. ATL believes the NRC is correct to insist that temperature controls alone are not sufficient protection from red oil explosions. Given both the domestic and foreign experience, DCS needs to enhance its control methods in this area.

- Training. The training of plant personnel fails to emphasize the basic science behind the plutonium purification and MOX fuel-fabrication process. ATL believes that too much importance is placed on following procedures without understanding the process, and this was a key factor in the Three Mile Island event. Training plans should emphasize the science and technical basis to assure that the personnel fully understand the processes occurring in the MFFF.

The following table contains ATL's comments. It is organized by DSER section and, within each section, by design and operational concerns. Page numbers are included when applicable.

Reviewer Comments on the April 30, 2002, version of the Draft Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility
Prepared by Advanced Technologies and Laboratories International, Inc. (ATL) January 17, 2003

The following table contains the comments and questions noted by ATL during its review of the April 30, 2002, version of the Draft Safety Evaluation Report on the Construction Authorization Request for the Mixed Oxide Fuel Fabrication Facility.

No	Location	Problem	Comment
			Section 5: Safety Assessment of the Design Basis – Design Issues
1	5.1.4.2 p 5.0-5	Excludes malevolent events	Malevolent events have been excluded from this evaluation. While the reviewer is aware that the NRC is addressing malevolent events at nuclear facilities as part of the generic agency deliberations, it is suggested that a reasonable set of air crashes and explosions be evaluated. This would be especially beneficial if it can shown that the consequences of such events are bounded by existing analyzed accident events.
2	5.1.5.2 p 5.0-20	Dose consequence loss of HEPA	Is the NRC staff satisfied with the applicant's conclusion that a loss of the final HEPA filters will not result in an over-the-threshold dose release to the public? While the distance from the facility to the general public areas is several miles, there are public roads and the particulate material trapped on the HEPA filters could become airborne during a fire or explosion.
3	5.2 p 5.0-32	Pyrophoricity of PuO_2	The reviewer is aware that, under some conditions, UO_2 can oxidize to form U_3O_8, but this is not a high-probability accident at a MOX fuel facility because the plutonium and uranium oxides are normally handled in small batches rather than large-volume oxidizing towers. The NRC seems to be placing too much emphasis on minimizing the sub-stoichiometric UO_2 and PO_2 and controlling the pyrophoricity. It is suggested that this issue be dismissed unless specific events demonstrate its importance.

No	Location	Problem	Comment
4	5.2 p 5.0-32	Projected flight paths	Why do future projected flight paths present an NRC concern? Does the NRC have a reference to cite that identifies projected future flight paths in the SRS area? Could future flight path problems be expanded to every licensed facility in the future? Is the NRC willing to accept the use of DOE standard DOE-STD-3014-96 "Accident Analysis for Aircraft Crash into Hazardous Facilities" to evaluate this issue?
Section 5: Safety Assessment of the Design Basis – Operational Issues			
5	5.1.5.3 p 5.0-23	3013 Container cask accident	An unidentified and unanalyzed accident may exist when opening the transport pack to remove the 3013 container. Is it possible for the transport pack lid to drop into the transport pack and rupture the 3013 container? If so, this accident should be analyzed and appropriate safety measures should be implemented.
6	5.1.5.4 p 5.0-28	Pressure vessel accident	Standard industrial accident reviews for manufacturing facilities normally include an evaluation of a compressed gas cylinder (such as those used to hold welding gases, nitrogen, or helium) becoming a missile when their top valve fails or is broken off. The draft SER does not discuss this event. Why?
Table 5.1: Principal Structures, Systems, and Components (PSSCs) and Design Basis Functions and Values Developed from the Safety Assessment – Design Issues			
7	General	Comparison of Section 5-1 with Table 5.1	Table 5.1 lists all of the PSSCs while Section 5-1 lists only those PSSCs the staff evaluated. This distinction is vague, and the wording in Section 5-1 should be enhanced to make this clearer.

No	Location	Problem	Comment
8	3013 Canister	Accident sequences	The NRC staff is using the test criteria from 10 CFR 71.73 for the 3013 canisters. What testing is required for the reusable PuO_2 storage cans used to store the PuO_2 before it is fed into the blending and pelletizing line? Is it possible for any of the storage cans to be subject to elevated internal pressure from water disassociation or internal gas generation? If so, what type of performance testing will help assure that the 3013 and storage cans will withstand the internal pressure?
9	Fire suppression	PSSC designation	Beginning on page 5.0-16, PSSCs related to fires are discussed. While several other systems such as combustible material controls, confinement systems, and worker actions are given as PSSCs, the fire detection and suppression system is not included. Are these systems listed as PSSCs elsewhere?
10	Missile barriers	Accident comparison	Are the postulated missiles used for MFFF the same as those used for commercial reactors in the area? If not, why are they different?
11	Material handling	Finished rods damage	Section 5-1 does not support this as a PSSC.
12	P 5.0-23	Worker action as PSSC	Page 5.0-23 gives worker action as the PSSC for fuel rod drops. This PSSC is not included in Table 5-1.

No	Location	Problem	Comment
Table 5.1: Principal Structures, Systems, and Components (PSSCs) and Design-Basis Functions and Values Developed from the Safety Assessment – Operational Issues			
13	Maintenance and surveillance	Mo boats & ball jars	The Mo sintering boats, ball mill jars, J60, and J80 transport jars are subject to wear and degradation. What type of physical surveillance program will be implemented to inspect the boats and jars for warping or cracks and to remove them from service before they fail?
Section 7: Fire Protection – Operational Issues			
14	General	Glovebox fires	The discussion of glove box fires may be inadequate. Does the NRC staff have additional information on fires, and can this information be added to the next draft of the SER?
Section 8: Chemical and Process Safety – Design Issues			
15	p. 8.0-7	Laboratory quantities	The NRC staff is correct to be skeptical of the estimate that 5 grams of PuO_2 will be the total lab inventory.
16	8.1.2.5.2.5.	Red oil	The NRC staff is correct to insist that temperature control alone will not be sufficient control to assure safety from red oil explosions. Given the U.S. and foreign experience, this event needs careful review and strong preventive measures.

No	Location	Problem	Comment
17	Ref 8.3.11	Dissolver explosions	The last U.S. problem with the PUREX process was the Hanford chemical dissolver explosion. Although it was caused by a unique set of circumstances, the fact that it happened and was recent indicates that the problem needs to be addressed – probably through acid concentration control.
18	p. 8.0-25	Emergency control room	Paragraph 4 on page 8.0-25 states that the only chemical safety PSSC identified by the applicant is the emergency control room air conditioning system. This infers that only the emergency control room operators need to be protected from a chemical release to resolve the problem. Is this true or are the analyzed chemical accidents bounded by other previously analyzed events?

No.	Location	Problem	Comment
19	Missing section	Pu storage can rupture	"Explosions" caused by the water of hydration is a known problem that should be discussed in this section. When PuO_2 is made by the oxalate precipitation process, it is very wet (both entrained water and attached water molecules [hydration]). Normal drying only gets out the entrained water, and the calcining step drives off most of the water of hydration. After these processes, if the powder is stored for too long, the heat and gamma radiation breaks the remaining hydrated water free. This leads to a steam pressure buildup in the reusable PuO_2 cans that may result in a sudden rupture (i.e., explosion) of the container. This explosive rupture blows PuO_2 powder all over the storage vault, and the resulting cleanup costs are very high. An event similar to this occurred in the PNNL vault at Hanford. To prevent "popcorn plutonium" from rupturing the storage cans, the usual practice is to high fire it in air to burn off all the water and fully oxidize it. The resulting PuO_2 powder is called "dead burned" and, unfortunately, it is not suitable for pelletization. If the NRC demands "dead burned" powder, DCS will not be able to make fuel pellets. The process must be designed to calcine the powder until it is pretty dry and then place strict limits on how long it can remain in storage. Careful research into PuO_2 drying may yield a process that generates a powder that can be stored for months and still be sintered. The applicant needs to identify the process or administrative control that prevents that one forgotten can in the back from rupturing.

No	Location	Problem	Comment
			Section 9: Radiation Safety – Operational Issues
20	T 9.1-3	Pu concentration	Values given: 20 percent MOX and 5 percent MOX for PuO_2 mix batches are different than those values used in the Chemical Safety Section (p. 6.0-11) that are 22 percent MOX and 6.3 percent MOX. Why are these values different and lower?
21	T 9.1-7	Loss of confinement	DCS and the NRC have selected different events as the bounding case. The reason is not well explained, and the 5X difference in dose result stands out.
22	p. 9.0-19	Foreign experience	The reviewer expected to see a better discussion on foreign and domestic fuel production accidents or exposure events, and the steps taken to mitigate or prevent similar occurrences at the proposed facility.
			Section 10: Environmental Protection – Design Issues
23	Table 10.1-3	Bounding accident	The draft SER indicates that the NRC has identified a fuel assembly drop as the bounding accident. It appears that this conclusion is based on an evaluation of spent nuclear fuel assemblies made by the Sandia National Laboratory. This study is not applicable to the MOX fuel fabrication facility because the Sandia study was done for the Yucca Mountain Project and involved spent fuel assemblies that are very fragile, whereas the MOX facility will be handling new fuel assemblies that are much more durable. The bounding accident for load-handling events is probably a Dissolver Tanks Rupture or Jar Drop.

No	Location	Problem	Comment
Section 11: Plant Systems – Design Issues			
24	11.1.1.3.2.2	Wind loads	The NRC should check to see that the MFFF wind loads used by DCS are consistent with wind load used elsewhere on the SRS.
25	p.11.1-11	Aircraft crash	The NRC wants future flight frequencies taken into account. Is the NRC willing to accept the use of DOE standard DOE-STD-3014-96 "Accident Analysis for Aircraft Crash into Hazardous Facilities" to evaluate this issue? If so, the DSER should address this issue.
26	11.8 - General	Pipe x ray	Welded pipes are to be radiographed, but no specification is directly referenced. Will the NRC accept ASME Boiler & Pressure Vessel Code, Section V, Article 2, WB-5111 or similar guidelines?
27	p11.9-6	Calcination furnace	Is there a glovebox around the calcination furnace? Failure of the N_2 bulk gas supply to the graphic bearings on the calcination furnace could allow a release of PuO_2 material that would be contained in a glovebox but may contaminate the area if the furnace is in the open.

No	Location	Problem	Comment
Section 11: Plant Systems – Operational Issues			
28	11.6.1.1.2.1	Diagnostic software	Can the diagnostic software override a PSSC control system? Can it put out information that can cause the operators to override a PSSC system? What failure mode analysis has been done on this system?
29	p.11.7-2	Powder handling	In those processes involving dumping powder from cans, the NRC should ask for empirical evidence that the various cans will be completely emptied. Residual material leads to material unaccounted for (MUF) or to sudden spills and surprises elsewhere in the process line.
30	p.11.7-4	Pellet pressing	The Liquid Metal Fast Breeder Reactor (LMFBR) fuel pellet pressing process included a preliminary briquet and crush step to yield a coarse powder form that would flow into the press die cavities. Otherwise, a great deal of powder was left on the press platen and scattered about the press glovebox. The press glovebox was the second highest location of personnel radiation exposure. Light Water Reactor (LWR) pellets are almost 3x the diameter of LMFBR pellets; thus, die filling may not be a problem. Nevertheless, the NRC should ask more direct questions regarding the disposition of the powder that doesn't go under the press punches.

No	Location	Problem	Comment
31	p.11.7-4	Powder grinding	Powder ball milling produces lots of fine dust and hold up. How is DCS going to recover residual powder in the ball mills without a lot of washing that produces a lot of liquid waste? Powder size reduction (using jet mills, not ball mills) was the highest exposure operation for the LMFBR fuel line because the powder being treated was spread over the greatest area at this unit. The NRC might ask about control of powder during the ball mill loading and unloading steps.
32	p.11.7-13	Spill cleanup and recovery	Surprising amounts of Pu and MOX powder accumulate inside of gloveboxes. Vacuum cleaners, hand brooms, wipe rags, etc. have been used to clean up this material. These methods collect some material, and they need to be accounted for and recovered. Section 11.7 did not cover the recovery of cleanup material and its recycling.
33	p.11.7-13	Personnel exposure	Glove pin holes are a source of personnel exposure and contamination. In all processes that involve glove access to Pu powder environments, the NRC should look for a rigorous program of self monitoring and establish a glove-change regimen that replaces gloves well before their expected failure point.

No	Location	Problem	Comment
Section 12: Human Factors Engineering (HFE) for Personnel Activities – Design Issues			
34	12.1.3	Past experience	A MFFF will ignore all past American experience for fuel manufacturing plants and will only consider French experience for HFE design items. This may be right, as it is a COGEMA process line, but all past experience in the United States as wll as foreign fuel facilities should be evaluated for potential applicability at this facility.
Section 12: Human Factors Engineering (HFE) for Personnel Activities – Operational Issues			
35	General	HFE details	This is all very vague and general. Maybe it is to be expected at the CAR phase. A more detailed documentation of the NRC's review and findings is expected in the SER for the license to possess and use special nuclear material.
Section 13: Safeguards – Operational Issues			
36	13.1	Physical security	The safeguards section should be enhanced to clearly identify the precautions against unwanted visitors. In the post 9/11 era, a MFFF needs a good explanation of how the plant is protected from terrorists.
37	13.2	Material Control Accountability (MC&A)	In the past, the NRC relied heavily on physical inventory to support MC&A. This was a major source of personnel radiation exposure. It is good to see the increased reliance on automated measurement methods.

No	Location	Problem	Comment
38	13.2	MC&A general	The treatment of protection of the Pu from ordinary theft by the operators is incomplete at this time. As this is weapons-grade Pu, up to the master mix stage I would have expected continuous, two-person, physical surveillance as a minimum. Beyond the MOX start point, places where an operator can remove material from the process line need to be stressed.
Appendix B: Description of MOX Process -- Design Issues			
39	General	Terminology consistency	Does a MFFF have as many types of product containers as the names used imply? I noted jars, baskets, pots, trolleys, cans, boxes, trays, 3013 containers, casks, packages, et al. Floor storage is called wells, pits, and vaults. It is important for clarity and reviewer understanding that consistent terminology be used in the CAR. DSC should be urged to always use the same name for the same object or action. A glossary or list of terms would be helpful to individuals trying to understand this document.
40	General	Ease of reading	This section would be substantially easier to understand with a series of sketches showing the process steps. Figure 1.1-5 is lacking technical data.
41	P. B-2	Moisture content of PuO_2 powder	How is the moisture content of PuO_2 measured? If received powder has too high a content, it is subject to pressure buildup while in storage in the PuO_2 receiving & storage area. Cans have ruptured due to this process (see comment No. 19).
42	B.3	Dropped cask lid accident	Does the accident analysis cover dropping a shipping cask lid onto a 3013 container and breaching it?

No	Location	Problem	Comment
43	B.5	Pu MC&A and contamination	Every container that moves powder will have a heel and be contaminated, and is a potential source of contamination. No amount of manual cleaning will remove all the PuO_2. The process needs these steps but should never assume that an empty container is totally free of PuO_2. How is this Pu eventually measured and possibly recovered?
44	B.10	Recycle of pellets	The description indicates that the recycled pellets go to the Primary Blend Mill (p. B-14) and to the Scrap Milling Unit (p. B-15). Which is it?
45	B.13	Double batting	Can the Jar Storage & Handling Unit mix up the J60 and J80 jars and send the wrong one?
46	B.15	Boat jams	This type of furnace operation in which the Mo boats are pushed through in a train is known to jam (mostly due to boat warping). When that happens, the train buckles and a boat can be dumped. Accident analysis needs to consider this process upset.
47	B.15	Furnace melting	The furnace walls and gas exhaust system are protected from melting and release of contamination by the furnace wall cooling pipes. These should appear as safety items.
48	B.20	Pellet grinding	Self cleaning filters for dust from pellet grinding should be reviewed to see if they are effective. Past experience at DOE facilities has demonstrated numerous problems with this type of filter.

No	Location	Problem	Comment
			Appendix B: Description of MOX Process -- Operational Issues
49	15.4	Training	The training of plant personnel lacks provisions for training operators in the basic science behind the processes they are controlling. Too much emphasis on following procedures without enough understanding on the operators part produces actions in emergency situations that are less than adequate. Training plans should include enough knowledge to ensure that the operators understand the processes.
50	General	Accumulation of MUF due to errors in measurement	There are many points in the process that rely on weights of both the product and container to perform MC&A. I counted at least 30. All of these, especially the container heels, will add up. How is DCS addressing the accumulation of MUF due to weight measurement precision and the accumulation of measurement errors as the product moves through the system?
51	General	MC&A process	All weight steps on receipt of material transfer take place **after** container lid removal. Is it not better to weigh first?
52	p. B-2	Personnel radiation exposure	The greatest contributor to personnel dose from Pu is neutrons from spontaneous fission and the α-n reaction caused by Pu-238 with low atomic number materials like fluorine and oxygen. The analysis should be careful to cover this.
53	B.4	Pneumatic container transport	What experience does COGEMA have with pneumatic transport? What problems arise due to power loss, container jams, container breakage, and container external contamination?

No	Location	Problem	Comment
54	B.5	PO_2 buffer storage unit	How long may a can remain in the buffer storage unit? What is the possibility that a can will pop its lid from internal steam pressure?
55	B.6	Vibratory conveyors	What has been the experience with vibratory powder conveyors? Do they create dust? How much material do they hold up? What happens during a power outage? How are they cleaned? Is their weight function sufficiently accurate?
56	B.6	Recycle of sintered scrap	There are limits to how much previously sintered material can be recycled into new product. Previously sintered material does not densify and bound as does true green material. Is there a control on the amounts allowed?
57	B.7	J60 jar wear	When coupled to the ball mill, the J60 jars are worn by the milling process. Is there a process to measure their wall thickness and/or to remove the jars from the process after a fixed number of cycles
58	B.8	Double batch at final dosing unit	Transfer of J60 jars to the final dose hopper is performed at the operator's request. Is it possible to overfill the feed hopper causing a criticality problem?
59	B.9	Homogenization and pressing badly described	The mixing final process is not described. Is this a V-blender? The pressing process, usually a source of dust, contamination, reject pellets, and process problems, is passed over lightly in the description.

No	Location	Problem	Comment
60	B.19	Inspection boxes size	Assuming LWR pellets are 5 times more massive than LMRBR pellets, the visual inspection rate would be 40 pellets per minute. It is going to be difficult to weigh; visually inspect for chips, cracks, or surface imperfections; and verify the dimensions of each pellet at that rate. Are the boxes large enough? Is there buffer storage to support this?
61	B.22	Pu waste	How are containers "cleaned" in this glove box? What happens to the waste?
62	B.25	Process description	The process description says that "welding nonconformity" has their ends cut off and are re-welded. This inspection step is separate from the final inspection process and implies that an acceptable fuel rod can be produced an inch or so shorter than other rods. Is this accurate?
63	B.25	Process thru put	Is there enough buffer storage to hold all rods until the results of radiography, dimensional, metallographic, corrosion, and contamination inspections are returned?
64	B.25	Terminology	The weld samples produced for destructive examination are usually called test pieces or weld qualification pieces. To call them "rods" confuses them with the loaded, fissionable product.
65	B.2X	MC&A	At the process point that acceptable rods are in hand and have unique identities, it would be advisable to accurately determine the Pu content using the methods applied at the head of the line (i.e., gamma spectroscopy and calorimetry). This would establish a known Pu content and a new basis. Otherwise, the shipped product will rely on dozens of accumulated individual weight measurements and always be called into question.

No	Location	Problem	Comment
66	B.28	Pu contamination	Helium leak check is performed after rod tray loading and rod storage. If a rod is leaking, it has the potential to contaminate those two processes and their equipment at this point.
67	B.29	Process thru put & process description	Is each rod subject to film radiography? Is the process big enough to hold all rods waiting inspection? Possibly the inspection relies on xerographic techniques, and the film radiography is a process control. Cannot follow the description.
68	B.30	Process description	The function of the inspection step is unclear. Pellet stacking, external alpha contamination have previously been determined. Pu assay by neutron activation is useful to determine content (see B.2X above). What is done with this information? Why are these inspections performed?
69	B.31	Operator dose	Visual inspection of rod trays is a source of high operator exposure. The NRC should verify the supporting calculation.
70	B.32	Process description	There is no description of how removed pellets are returned to the Scrap Milling Unit. It is doubtful if the pellets can be removed by vibrating the rod. Expect a push ram and possibly sectioning will be required to get the pellets out.
71	B.3X	Process description	At some place after the Rod Inspection & Sorting Unit, the rods emerge from the glovebox line. That part of the process is not described.
72	B.34	Process description	The description of rod pulling into bundles is hard to visualize if the assemblies have intermediate spacer grids like most LWR bundles. Grids are implied on page B.36.

No	Location	Problem	Comment
73	B.38	Terminology	Are the rack and strongback the same? If so, call them by the same name.