Department of Energy
Washington, DC 20585

July 21, 2006

The Honorable A.J. Eggenberger
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

Your April 24, 2006 letter concerned the Repackaging Methodology developed in response to Board Recommendation 2005-1. Your letter provided Defense Nuclear Facilities Safety Board staff comments and requested a report addressing these comments. To address this matter in detail, the DOE 2005-1 working group developed the enclosed DOE comment resolution.

If you have any questions, please call me at 202-586-4693 or Mr. Richard Stark at 301-903-4407.

Sincerely,

C. Russell H. Shearer
Acting Assistant Secretary for
Environment, Safety and Health

Enclosure

cc:
M. McConnell, NA-1
C. Lagdon, US-1
M. Whitaker, DR-1
R. Hardwick, EH-2
R. Stark, EH-24

U.S. DEPARTMENT OF ENERGY COMMENT AND RESOLUTION SHEET			
Document Title **Methodology For Determining Repackaging Needs and Prioritization Of Repackaging Nuclear Materials**	Document Number **3/30/06 Prioritization Methodology Paper (management tool)**	Document Date **Issued to field 03/30/06**	Date Comments Sent **04/24/06**
Commenting Individual (Office/Name/Signature) **DNFSB**	Phone	Resolution By (Office/Name) **R Stark ES&H, EH-24**	Phone **(301) 903-4407**

No.	Section or Paragraph	Comment, Suggested Solution	Resolution of Comment
1		**1. The vulnerability of package components should be reincorporated into the option 1 model.** The vulnerability parameter from the original LA-UR-05-3864 model has been removed from the model adopted as option 1. By not attempting to account for the vulnerability of the package, option 1 currently assigns the same failure probability index to a specific material form, regardless of the type, number, or robustness of the containers. A model that does not attempt to account for the vulnerability of the package to known failure mechanisms is not likely to estimate failure probabilities accurately. Assuming container vulnerability is fully reincorporated in a future revision of the model, the following sub-comments apply: **(a). The vulnerability indices for unknown inner containers may not be appropriate for the characteristics of the population.** The assignment of maximum vulnerability for unknown containers results in assigning packages with inner containers known to be highly vulnerable a lower failure probability than packages consisting of unknown inner containers within the same outer container. This may not be appropriate if a large number of packages having initially unknown inner containers are eventually shown, on average, to contain much more robust containers than the assumed worst-case scenario.	The Department recognized the difficulty in estimating the failure probabilities in the many types of existing containers, especially the inner container failure probability. In the DOE March 30, 2006 letter to the DOE sites which transmitted the Risk Prioritization Methodology paper, DOE stated "Because some site information needed in estimating existing package integrity may not currently exist (such as estimating the integrity of inner containers within sealed outer containers), each site plan should include specific checks during the initial repackaging efforts to confirm that their existing package assumptions and estimations in their implementation plan remain valid or whether the [site] prioritization plan needs to be appropriately modified. A sampling plan may be employed to achieve this confirmation." In this way, the uncertainties in estimating failure probabilities in existing packages at each site will be determined and removed (or greatly minimized) for each model (Option 1 or 2).
2		**(b). A listing of standardized container vulnerability indices for package configurations that are present in the complex is not provided.** There can be no expectation of consistent choices for container vulnerability indices across sites without an agreed-upon list. The packaging information collected under the first Implementation Plan commitment could be used as the basis for providing expert judgments to form this list.	Because of the wide variety of package types, the large variation in material contents, material forms, material chemical properties, and the resulting worker hazards a standardized listing is not practical.
3		**(c). The use of zero values for minimum vulnerability indices creates inconsistencies in the predicted results.** The assignment of zero value vulnerability indices to a barrier having otherwise maximum indices results	The values will be modified to use factors of 1-4 (on a 1-4 scale) instead of 0-3 for the Option 1 model. DOE will issue an addendum sheet to the March 30 Risk

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		mathematically in a degenerate total container vulnerability vector for packages having unknown barriers. For example, three nested slip-lid cans would have the same vulnerability index as a single such can with unknown inner containers.	Prioritization Methodology.
4		**(d).The fifth reactivity parameter for radiation-induced challenges to the package is not utilized.** Recent experience with package failure has reinforced the importance of this challenge to the packaging. Assignment of values reflecting the true radiolytic potential of the material, rather than a placeholder value of 1, might better account for potential radiation damage to polymer-based packaging.	The radiolytic damage factor in the Option 1 model is a placeholder for future use since insufficient data is currently available to assign indices for this factor for all the materials (and types of containers) that may be currently encountered across the complex. Data gathering during the initial prioritization and repackaging campaigns (if of sufficient quantity and quality) may permit the use of this factor to adjust the priority for repackaging for following packaging campaigns. Since Plutonium (Pu) has a higher specific activity than Highly Enriched Uranium (HEU) and will likely do more damage to polymer based material (plastic contamination wrapping, etc), we will make the following adjustments. To make the Option 1 model more conservative, default values for the Reactivity Index I5 component of 4 for Pu-238, 3 for Pu-239 and 1 for HEU (using a 1-4 scale) will be used. This note will be included in the addendum.
5		**2. The reactivity indices provided for option 1 in LA-UR-05-3864 do not reflect known differences in reactivity among elements.** For example, a highly reactive material, such as plutonium metal, is currently assigned the same reactivity indices as a considerably less reactive material of the same form, such as uranium metal. There may be a need for additional expert judgments regarding other material forms to account for differences in reactivity among elements.	See response to 1. above. DOE will also add a note that Plutonium (Pu) metal is more reactive in air than Uranium metal and this should be taken into account in the prioritization campaign. We will also make the following adjustments. To make the Option 1 model more conservative, the default values for the Reactivity Index I4 (oxidative expansion) component of 3 for Pu metal and 1 for U metal (using a scale of 1-4) will be used. This note will be included in the addendum.

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6		3. **The assumed linear effect of package age on failure probability may warrant further refinement.** There may be other time-to-failure relationships that agree better with recent survey and package failure data. For example, a survey of the literature suggests nonrandom failures of components that wear or degrade over time may exhibit a more than linearly increasing failure rate over time. Appropriate consideration of age strongly impacts the accuracy of package failure predictions.	See response to 1. above. Thus far, the survey data collected at LANL has not revealed a basis for changing the linear dependence of age in either Option 1 (or Option 2) models. As more data is collected during the initial prioritization and repackaging campaigns, the site assumptions will be modified, if appropriate.
7		4. **The value of allowing for the use of alternative package failure probability models is unclear.** Having two options for determining relative package failure probability could result in identical packages being ranked in a different order at different sites. In principle, a single methodology is preferable because it facilitates meaningful comparisons of the risk posed by packages across the complex. Having a single methodology would provide an important tool for the Department of Energy (DOE) to ensure that the highest-priority items are qualified or repackaged first at all sites, as stated in Section 5.3 of the Implementation Plan.	The second option was developed for sites which do not have sufficient package information to support the first option. It is not as detailed as the first option but nevertheless addresses the important package parameters needed to estimate package failure probability. Either option when used in conjunction with the initial repackaging confirmation described in the response to Comment 1 will produce estimates of existing failure probability. Both options use the same dose estimation. Therefore, packages that contain very high potential doses will score very high in either package failure probability model.
8		5. **No evidence is presented to support the option 2 model.** Without data to support the judgments made on individual values used for the parameters or the model itself, there is no way to assess the validity of the option 2 model for predicting package failure probabilities.	The second option was developed by working group members based on all known package vulnerabilities and package failure mechanisms. Both models were developed based heavily on expert engineering judgments. It is likely that the initial uncertainties of this model are greater that the uncertainties of the first model. To appropriately deal with package uncertainties in both models the working group has instructed all sites to confirm their initial package failure estimates during the initial repackaging efforts and to modify the site implementation plan based on the actual package reliability findings. In this way the initial uncertainties in both models will be addressed and the uncertainties removed (or greatly minimized). The response in 1.a above also addresses uncertainties in this option.

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9		**6. Some parameters and numerical indices used in option 2 appear inconsistent.** While the values chosen appear to be generally reasonable and attempt to account for the robustness of the package, the values assigned for unknown conditions do not appear to be consistent with respect to the parameters for known conditions.	The second option was developed by working group members based on all known package vulnerabilities and package failure mechanisms. Both models were developed based heavily on expert engineering judgments. It is likely that the initial uncertainties of this model are greater that the uncertainties of the first model. To appropriately deal with package uncertainties in both models the working group has instructed all sites to confirm their initial package failure estimates during the initial repackaging efforts and to modify the site implementation plan based on the actual package reliability findings. In this way the initial uncertainties in both models will be addressed and the uncertainties removed (or minimized). However, the working group agrees to make a change to increase the conservatism. Therefore, we will modify the values assigned to factor H [Conditions when material packaged)] from 3 to 0, for unknown conditions, and to factor I [Potential for radiolytic damage] from 3 to 0, for unknown conditions, the same as for High. This will increase the conservatism of the Option 2 model for these two factors. This will be added to the addendum.
10		**7. The threshold dose consequence in the repackaging document appears to be inconsistent with the threshold being proposed in the draft packaging manual.** The chart in Appendix C of the draft repackaging document illustrates the threshold for repackaging as a potential dose consequence of 5 rem committed effective dose equivalent or greater, using the methodology of Los Alamos National Laboratory for calculating the dose to workers. This approach yields considerably different results from the threshold the staff understands to be proposed in the draft manual, which is based on the methodology in 49 Code of Federal Regulations (CFR) 173 and does not use airborne respirable material calculations. This inconsistency results in excluding packages with sufficient quantities of material to be within the scope of the manual from the repackaging prioritization process.	The thresholds are consistent. All thresholds are consistent with the IAEA/DOT recommendations/requirements i.e. 5 rem whole body dose or 50 rem organ dose to the worker. This is a committed dose (CEDE or CDE) that is calculated to be delivered over a 50 year period, therefore the estimated annual dose averages 100 millirem per year. The latest version of the draft manual uses several different methods, but all are based on the above mentioned dose consequences as thresholds to invoke the robust package storage and surveillance requirements.

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11		**8.** DOE's review process for Recommendation 2005-1 deliverables needs improvement. Many of the problems identified by the staff ought to have been identified by the technical review board and resolved before the draft document was transmitted to the Board. A subsequent staff review of the comments of the technical review board revealed that in fact the technical review board had identified some of these problems. Although most of the technical review board's comments of an editorial nature were addressed, the more significant comments were not resolved. The comment resolution process needs to be improved and better integrated for future deliverables.	The DOE Technical Review Board (TRB) is an additional internal Departmental review process that is composed of DOE Federal employees and DOE contractors. There are five TRB members. They are knowledgeable DOE individuals who are not a part of the DOE 2005-1 complex wide working group tasked with developing the repackaging risk prioritization methodology. The DOE 2005-1 Implementation Plan approved by the Secretary of Energy on August 17, 2005 described the DOE TRB role and the intervals of activities of the DOE TRB. The DOE TRB has one specific Implementation Plan action dealing with the repackaging risk prioritization methodology. Per the Implementation Plan, the DOE TRB reviewed the repackaging risk prioritization methodology. Also per the Implementation Plan, the DOE TRB review products were sent to the DOE 2005-1 responsible manager for DOE disposition. The TRB submitted 113 comments and questions on the repackaging risk prioritization methodology. The DOE working group accepted 87% of the original DOE TRB comments, the remaining 13 % were a combination of observations that did not require actual resolution or comments that were not initially accepted and were the subject of a detailed discussion with the DOE TRB member. During that discussion, some of the TRB original comments that were not initially accepted were modified by the TRB member based on the discussion with the working group, some remained as originally written, and some were interesting observations that did not need to be addressed in the methodology. The DOE TRB provides valuable advice to the DOE 2005-1 responsible manager. The final responsibility for the contents of the repackaging risk prioritization methodology rests with the DOE responsible manager. All TRB comments were carefully considered by the working group before they were finally

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			dispositioned by the responsible manager. By accepting the majority of the TRB comments, the responsible manager has demonstrated that the internal review process is functioning effectively. The responsible manager has exercised prudent technical judgment in addressing the TRB review comments.