[DNFSB LETTERHEAD]

August 5, 1992

Mr. Victor Stello, Jr.
Deputy Assistant Secretary for Facilities
Office of Defense Programs
U S. Department of Energy
Washington, DC 20585

Dear Mr. Stello:

Enclosed for your consideration and action, where appropriate, are a number of observations concerning the adequacy of the design bases for the Replacement Tritium Facility and the Defense Waste Processing Facility at the Savannah River Site in Aiken, South Carolina. These observations are based on briefings and tours conducted by the Department of Energy staff and contractor personnel at the Savannah River Site.

If you need further information, please let me know.

Sincerely,

John T. Conway
Chairman

Enclosure

c:
Mario Fiori, DOE-DR-1, w/enclosure

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

July 17, 1992

MEMORANDUM FOR: G.W. Cunningham, Technical Director

FROM: J. Blackman
J.C. Sanders

SUBJECT: Savannah River Site Trip Report - Facility Design Overview Of The Replacement Tritium Facility (RTF), Defense Waste Processing Facility (DWPF) and Existing Tritium Facilities April 22 - 24, 1992 and June 10 - 12, 1992

1. Purpose: The purpose of the two visits was to perform an initial overview of the existing design bases of the subject facilities to determine if the design commitments, implementing criteria, and implementing codes and standards used were consistent with commercial nuclear industry standards and had been consistently applied.

2. Summary: The first review provided the overview of the facilities and the status of the design bases for the structures, systems and components. As a result of that meeting, a number of topics were identified which required further review and clarification to facilitate the development of judgments regarding overall facility design basis adequacy.

   The second visit focused on clarification for some of the questions raised during the first visit and examined, in greater detail, the design bases as well as codes and standards used in the implementation of the design of the structures, systems and components of the RTF and DWPF. Due to the large number of pertinent questions regarding these two facilities, the provisional status of the SAR of the existing tritium facility, and its changing mission, it was decided to concentrate on RTF and DWPF for this meeting. Further review of the existing tritium facility will be the subject of a later visit.

   The results of the limited overview indicate that the existing documentation and in some cases the evaluation methodology employed, led to the conclusion that the criteria governing the design of the facilities is not sufficiently comprehensive, is inappropriate for facilities of this nature, and that quality assurance commitments have not been consistently applied. Consequently, a reassessment of the design basis commitments and implementing procedures as well as implementation by DOE and WSRC is required to substantiate the adequacy of the facilities to ensure safe operation.

3. Background:

   a. Replacement Tritium Facility

      The mission of the RTF is to unload depleted deuterium-tritium mixtures from old

reservoirs, purify and enrich this mixture, and resupply the refurbished reservoirs. The RTF consists of three separate buildings. The main facility is built underground in order to provide added security and improved resistance against most natural hazards. The diesel generator and HVAC buildings sit above the ground based on the concept that these facilities are not required to maintain the safety and integrity of the facility during a safe shutdown event.

The original design for the RTF was initiated by Dupont in 1979. In the late 1980's, as the design and construction process progressed, Westinghouse Savannah River Company (WSRC) replaced Dupont as the site contractor. WSRC replaced Dupont with United Engineers and Constructors (UE&C) as the designer and constructor of the RTF. In 1991, Bechtel National, Incorporated (BNI) replaced UE&C as the lead contractor for this facility.

b. Defense Waste Processing Facility

The role of the DWPF is to vitrify high-level radioactive wastes contained in many of the SRS high level radioactive waste storage tanks. The process involves the separation úand concentration of high-level wastes which are then mixed with a borosilicate glass. After heating this mixture, the waste is then poured into stainless steel canisters. The canisters are then plug-welded and the outside surface decontaminated in preparation for interim storage. Ultimate disposal involves shipment off site to a long term repository.

4. Discussion:

a. April 22 - 24, 1992 Overview of RTF, DWPF and The Existing Tritium Facilities

The initial presentation by DOE/WSRC included generic site related design information for meteorology, geology, seismology, hydrology, wind, tornado and geotechnical exploration data. Following this presentation, there were specific facility related reviews of the RTF, DWPF and TF covering conformance with DOE Order 6430.1A and applicable industry standards, safety classification of structures, systems and components, as well as mechanical and electrical systems design standards. Numerous reference documents were requested for review which were intended to provide further detail regarding the design bases.

A substantial number of questions were raised by the DNFSB staff and its outside experts. The most significant questions are delineated below preceded by a summary of the material presented. Further details regarding some of the questions raised are provided in the outside experts' trip reports which are attached:

(1) Generic Facility Design Related Items

(a) Meteorology - Basic site meteorological conditions were reviewed

and information such as prevailing wind directions, normal and extreme temperature and humidity conditions as well as wind and tornado information were presented.

WSRC stated that experiments have been conducted to confirm the validity of the computer simulation models in use. The results indicated that the analyses used to predict the transport and dispersion of potential contaminants to the site boundary do not correlate well with test results under all conditions. Specifically, while daytime results were reported to have agreed with simulations, the nocturnal results did not. WSRC was not aware if the experimental results were used to modify or otherwise calibrate the computer simulated~studies performed during emergency preparedness exercises or if the Safety Analysis Report for these facilities reflected the uncertainties of the experimental results. This topic was included in the June 10 - 12 agenda and is discussed in Section 4.b.(1).(a) of this report.

(b) Hydrology - Basic site hydrology information was presented and in particular the hydrostratigraphy of the separations area. It was stated that this area is underlain by two primary aquifer systems which, due to the trends and depths of these structures and hydraulic head differences, suggest that local site contamination will migrate to streams and ultimately the Savannah River. By virtue of these features, WSRC stated that the aquifers will not become contaminated with waste releases from SRS. Due to the complexity of this topic, it is planned as the subject of a separate review session at a later date.

It was also stated that no formal groundwater modelling programs were used in the dispersion prediction. This would appear to be inconsistent with accepted practice especially in view of the environmental importance of this information. In addition, WSRC indicated that the contamination plume under the tank farm is migrating very slowly and will take approximately sixty years before it reaches the Savannah River. While it is understood that remediation measures are currently underway to rectify the problem, future reviews will focus on the apparent lack of computer modeling studies and the ramifications, if any, of not using computer simulations.

(c) Geotechnical Data - The DNFSB staff had requested that the agenda for the meeting include the geotechnical exploration data requirements and the basis for selection of these requirements. This was to be a follow up to two other presentations by WSRC on the

subject (December 11, 199:1 and February 27, 1992). In response to this request, DOE/WSRC provided a comprehensive summary of existing data but did not present the requirements nor the basis for selection of the data. Consequently, they were not in a position to discuss the ramifications of any missing data. This subject was again included as part of the June 10 - 12 discussion.

(2) Replacement Tritium Facility

(a) Safety Class Items - During this presentation, a number of statements were made by WSRC which appeared to be inconsistent with the definitions of safety class items and the qualification requirements implicit in the DOE Orders. Specifically, WSRC reported that some of the instrumentation monitoring items, such as the seismic triggers and stack monitors, are seismically designed but not designated as safety class items. This is in contradiction to the requirements of DOE Order 6430.1A, Section 1300-3.2. It was not clear what definition of safety class systems, if any, were used in the design of RTF. It also appeared that the qualification of safety class items only included demonstration of seismic adequacy by means of analysis or test but not the implementation of appropriate quality assurance requirements for procurement of materials, fabrication, inspection, installation, etc. This subject was included in the June 10 - 12 agenda to provide clarification of the method used by WSRC to select safety class items and the qualification methodology employed.

(b) Tritium Storage Tank ASME Qualification - Another question arose regarding the basis for the qualification of the Tritium Storage Tanks. During the tour of the RTF, it was noted that one of the tritium storage tanks was marked with an ASME B&PVC Section VIII U stamp. However, WSRC personnel indicated that a ASME B&PVC Section III dedication process had been performed for the vessel, and therefore, the vessel was considered a Section III, Class 2 component. However, WSRC could not provide sufficient details of the process employed in the dedication for the DNFSB staff and outside experts to draw any definitive conclusions during their visit. It also appeared from the information provided that the dedication process was limited to evaluating the seismic adequacy of the vessel to Section III code rules. Other Section III requirements such as quality assurance, welding and cleanliness requirements had not been implemented. Therefore, the general subject of qualification of safety class items was included in the agenda for the June meeting.

(c) Main, Ventilation and Diesel Generator Enclosure Building Design Review - An overview of the design bases for these buildings was provided by WSRC. However, when questioned about the design margin available in the main building to resist additional loads, WSRC was unable to provide any information and indicated that the only design related calculations then available for review were two summary reports prepared by URS/John A. Blume & Associates on the 233-H Building (main underground building). It was indicated that WSRC was beginning the process of reviewing the files for available information and would continue the effort until conclusions regarding the adequacy of the buildings were reached. Consequently, the general subject of qualification of these buildings was included in the agenda for the June meeting.

(d) Safety Class Item Designation Related To Protection Of The Facility Worker - A summary discussion of the accident scenarios considered in the safety analysis of the facility was presented. It did not appear that any of these scenarios addressed possible exposure of facility workers within or adjacent to the facility during an accident. This is contrary to the Board's philosophy as well as current DOE Orders and commercial nuclear power plant practice. As a result, the emergency power system, ventilation and cooling systems are not designated as "safety class" systems. This question will be pursued at subsequent meetings on the design basis of the RTF.

(3) Defense Waste Processing Facility

(a) DOE Order 6430.1A Compliance Review - Since DOE Order 6430.1A was not an original design document for the DWPF, a conformance review of the facility design was initially performed by UE&C and completed by BNI. The process consisted of an initial screening of 3613 design criteria related items. This, in turn, required a more in-depth review of 613 items. Only 49 of the 613 items ultimately resulted in facility design changes. This small a number, by virtue of the complexity of the DWPF, would suggest that a review be performed sometime in the near future to assess what methodologies were utilized to resolve "open items" during the review process.

(b) Soil Modeling - A summary of the dynamic soil modeling parameters was presented on the afternoon of April 22, 1992. WSRC indicated that the dynamic soil properties were extracted from a 1978 D'Appolonia study. On the morning of April 23, 1992, another presenter indicated that the dynamic soil properties were

obtained from later work performed by Geotechnical Engineers, Incorporated (GEI). WSRC could not provide clarification regarding several questions, namely: 1) What prompted the additional work by GEI?, 2) Were there any different conclusions between the D'Appolonia and the GEI work?, and 3) How were these studies incorporated into the final analyses of DWPF?

(4) Existing Tritium Facility

(a) Earthquake and Tornado Design Basis Accident's (DBA) - It was reported that, on the basis of site boundary radioactivity release, earthquake and tornado loads need not be considered in the evaluation of the existing tritium facility. It would seem that this conclusion would require further review since it is inconsistent with the conclusions of the accident scenarios for the RTF. Inasmuch as the draft version of the revised Safety Analysis Report is not due to be issued until November, 1992, this conclusion may change pending further review by DOE/WSRC. However, it will remain a potential agenda item for future reviews of the existing tritium facility.

b. June 10 -12, 1992 Facility Design Overview of RTF and DWPF

The presentation by DOE and WSRC of generic site related design information for meteorology and geotechnical exploration data included an abbreviated version of the April 22 - 24 meeting and additionally addressed the issues arising from that meeting. Additional reference documents were requested at this meeting for review which will provide further detail regarding the design bases utilized in the two facilities.

(1) Generic Facility Design Related Items

(a) Meteorology - As mentioned in Section 4.a.(1).(a) of this report, WSRC employs several dispersion modelling programs in order to predict the transport and dispersion of potential contaminants resulting in off-site radiation dose effects due to both routine releases and various accident scenarios. The programs utilized include AXAIR, MAXIGASP, and POPGASP. It was again reported that testing performed to compare the predictions obtained utilizing these software codes with actual site conditions do not correlate well under nocturnal conditions because these conditions are typically quiescent. Although the models used were presented as state-of-the-art Gaussian Plume models and incorporated substantial conservatism to account for the uncertainties at low wind speeds, they are not useful as a prediction technique in this

situation. At these low wind speeds, the use of a Gaussian Plume model is not appropriate. Since industrial accidents have occurred under conditions where plumes travelled relatively undispersed for several miles, it would seem prudent to consider such a situation. It was not clear from the presentation that these types of accident conditions have been addressed in the evaluations performed.

In addition, since these models only consider the dose received through gaseous inhalation, the effects of isotopic exchange and subsequent wet deposition (rainout) may be significant depending on actual conditions modelled. All modes of material transport, not just the gaseous transport form, should be addressed when considering dose effects. In addition, low probability, high consequence situations should also be evaluated. Since the results given by the analyses now in use are not valid at distances less than about 0.4 kilometers from the point of contaminant release, approaches for development of on-site worker doses need to be addressed.

(b) Geotechnical Data - DOE/WSRC utilized the USNRC Standard Review Plan requirements for geotechnical - investigation requirements when assessing the adequacy of the existing geotechnical data for both facilities. Based on the work performed initially by D'Appolonia Associates and later by Mueser, Rutledge, Inc., DOE WSRC concluded that the information on DWPF represented an adequate characterization of the geotechnical data requirements and therefore no additional site investigation was considered to be necessary.

A preliminary geotechnical investigation on RTF was performed by Mueser, Rutledge, Johnston, and DeSimone (MRJD) in May, 1984. A second investigation was performed in October, 1984. At that time, it was concluded that no further site investigation was required. After comparing the data obtained in 1984 to the standard review plan requirements, DOE/WSRC concluded that a number of significant items were missing. Therefore definitive conclusions on soil properties and their effects on soil-structure interaction analysis could not be made. This has prompted a further review of just how the missing required information will be obtained. It was anticipated that the program summary will be available for review by August, 1992.

Since the basis for the design of the facility is dependent on valid representative geotechnical data, it would appear that the entire design of the facility is subject to question unless the missing soil

properties were conservatively estimated and/or parametric studies considering the range of possible variations considered when the facility was originally designed. Therefore, the geotechnical exploration program will be closely scrutinized in future meetings to insure that an adequate remedial program is developed that confirms that acceptability of the assumed data.

(2) Replacement Tritium Facility

(a) Safety Class Items and System Boundaries - The response provided by DOE/WSRC to the questions arising out of Section 4.b.(2).(a) of this report regarding the approach used to select safety class items prompted WSRC to review the question. Consequently, WSRC decided to undertake a review of the safety system boundary definition and component qualification process to assure adequate treatment of the safety class components within the system boundary. The form and scope of work for this task will be similar to the system classification effort undertaken in conjunction with the seismic analyses performed for the KReactor Restart Program. It would appear to be prudent to include a comprehensive compilation of traditional mechanical systems design information in the scope of this program in addition to the information originally contained in the related K-Reactor effort. Information of this nature is normally included in the development of System Design Descriptions. The targeted completion date for this effort is the end of July, 1992.

In addition, comparison of the existing safety related equipment lists with typical commercial nuclear safety related equipment lists suggests that safety class lists for RTF are not consistent with current commercial practices. Due to the significance of this effort, it will be closely monitored by the staff at a future review session.

(b) Tritium Storage Tank ASME Qualification - In response to the question regarding the basis for the qualification of the Tritium Storage Tanks, DOE/WSRC indicated that the vessel in question was qualified to the requirements of ASME VIII, Division 2 and that no attempt was made to perform a formal dedication as an ASME III/NC class vessel as had been previously stated. It was also stated that qualification consisted of evaluating the seismic adequacy of the vessel to Section VIII rules. Quality assurance and other related requirements had not been implemented. This issue is particularly significant in that by not following the quality requirements as the project had been committed to per NQA-l requirements, credit for the ability of the component to perform its

safety function during an accident conditions has not been provided.

(c) Main, Ventilation and Diesel Generator Enclosure Building Design Review - An overview of the design bases for these buildings was again provided by WSRC. It was reported that initial calculations covering the original design of the three buildings prepared by Dupont had been located and were under review. However, no conclusions as to the adequacy of these buildings were presented. In addition, URS/Blume had been contacted and had provided detailed calculations and other relevant information covering the original seismic qualification of the facilities performed from their files to WSRC. This information was also under review by WSRC and again no conclusions as to adequacy of the calculations or the adequacy of the buildings themselves had been reached.

(d) Safety Class Item Designation Related To Protection Of The Facility Worker - A summary discussion of the accident scenarios considered in the safety analysis of the facility was again presented. The scenarios presented did not address possible exposure of facility workers during an accident.

In addition, WSRC indicated that a review of Dupont standards used during design and construction was being undertaken with the purpose of comparing the provisions invoked to current applicable national and international codes and consensus standards. Inasmuch as this effort has not been completed, no assurance has been provided that the safety of the facility worker has been considered either directly or indirectly. This will remain an open item until further clarification is provided.

(3) Defense Waste Processing Facility

(a) DOE Order 6430.1A Compliance Review - As mentioned previously, since DOE Order 6430.1A was not an original design document for the DWPF, a conformance review of the facility design was performed. Of the 3613 items, only 49 ultimately resulted in facility design changes. Time did not permit a review of the process and details by which open items were resolved. It will need to be addressed in an in-depth manner at a later date.

(b) Soil Properties and Modeling Data - A summary of the soil data developed for the facility was presented. The work consisted of an initial study performed in 1978 by D'Appolonia and a later supplementary study performed by Geotechnical Engineers, Incorporated (GEI). The information presented satisfied the

questions raised at the April 22 - 24 meeting.

(c) Application of Codes and Standards Review - Work on the facility was originally begun by Dupont in 1979. They in turn subcontracted the design and construction to BNI. Dupont provided BNI with the design criteria and required the use of some Dupont standards along with industry codes and standards. From the information presented, it appeared that DOE/WSRC recognized that the use of classical industrial standards for a facility processing highly radioactive materials may have been imprudent. In this situation, appropriate consideration of the requirements for safe operation of the structures, systems, or components involved under adverse conditions may not have been achieved. Additionally, the codes and standards used were not adequately documented. Consequently, WSRC has implemented a review and requalification process to compare current requirements to those utilized in the design and construction. All resulting discrepancies will be evaluated and modifications performed, if necessary, to meet current codes and standards.

(d) Qualification Of Safety Class and Associated Structures - WSRC has initiated a program to provide necessary documentation to corroborate that safety class and associated structures were constructed to the specified quality assurance requirements. This work is being performed as part of the safety class items qualification effort and involves verification that the safety class items were designed to appropriate criteria and standards as well as designed and constructed under a quality assurance program. Based on the information provided, only specific DWPF structures are considered to be safety class items. Inasmuch as this effort involves corroboration that construction was performed in accordance with project drawings, it is an apparent acknowledgement that lapses have occurred either in actual field inspection or in the storage of records. A review of all existing documentation will be initially performed and where not available, other steps will be taken to verify that proper construction requirements were followed. This may include thorough visual inspections, nondestructive testing of installed materials and uncovering of reinforcing steel to verify location and size. Nondestructive examination may involve taking core samples or uncovering the reinforced concrete to assure uniform placement of the reinforcing steel and comparing the records to previous NDE examination records to calibrate the approach used. Until this program is completed, conclusions regarding the construction adequacy of the Safety Class and Associated DWPF facilities cannot be made.

The staff plans to follow this program in detail due to its potential impact on the safety assessment of the facility and request that other quality control documentation areas be sampled to determine if similar lapses exist.

(e) Building Design Review - During the presentation, a significant difference between the USNRC's definition of a Safe Shutdown Earthquake (SSE) and the comparable DWPF definition of a Design Basis Earthquake (DBE) were noted. Specifically, the SSE is specified in 10CFR100, Appendix A as "...that earthquake which produces the maximum vibratory ground motion for which certain structures, systems, and components are designed to remain functional. These structures, systems, and components are those necessary to assure ... capability to shutdown the reactor and maintain it in a safe shutdown condition..." While for the DWPF, the ability to safely shutdown the facility is considered during a DBE, but the building is not considered to be usable as a production facility afterwards.

In addition, an Investment Protection Earthquake (IPE) was specified in the design requirements for DWPF as that earthquake for which the facility can shutdown safely and resume operations after repair and/or replacement of certain items. The definition of an IPE is similar to the USNRC's definition of an Operating Basis Earthquake (OBE), while the definition of a DBE does not mirror the definition of an SSE.

Therefore, a basic inconsistency-exists- between the definition in the Code Of Federal Regulations for an SSE and the philosophy employed in the DBE definition for the DWPF. It also raises the issue as to how to safely shut down a facility after a DBE. In order to safely shut down safety systems, the integrity and functionality of the system must not be degraded. However the definition of a DBE used in the design of the DWPF accepts damage on a level in which the building is no longer considered usable. These two scenarios are incompatible. This has led to further question what criteria were used to evaluate the building to the DBE earthquake levels. Have criteria been developed consistent with post elastic considerations?

In conclusion, one has to question if the earthquake design bases is prudent based on the importance of this facility, the investment being made, and the potential need to be able to accelerate the processing of high level wastes after an earthquake given that storage tanks may be compromised and require removal of their contents expeditiantly?

5. Overall Observations:

a. A limited overview of the civil/structural design bases for RTF and DWPF, as described above, indicates that the existing documentation, and the evaluation methodology and design philosophies employed, do not support the conclusion that the facility design provides the required safety functions.

b. A summary of the programmatic design requirements that should be followed during this review is delineated in Board Recommendation 92-4. While the recommendation specifically addresses the Multi-Function Waste Tank Facility at the Hanford Site, it also delineates design requirements which are applicable to all new defense nuclear facilities. In particular, paragraph 3, item 2 states that "The design bases (criteria) need to be clearly defined, coherent, and compatible with the facilities' perceived lifetime functions ... and documented."

Specific identified deficiencies which highlight the above conclusion are:

(1) Replacement Tritium Facility

(a) The original soils investigation performed was deficient and as a result a remedial program is being undertaken to supply the required information.

(b) Design calculations, which are the basis for establishing the adequacy of the buildings, are not documented and therefore conclusions as to the ability of the structures to withstand the design loads have not been established. A remedial program to provide the documentafion and assessment of the adequacy of the structures has. been started by WSRC.

(c) Review of the design bases of the systems within the facility indicates that specific system boundaries have not, as yet, been defined nor has it been concluded that the implementing codes and standards were consistently applied.

(d) It has not been demonstrated that the codes and standards utilized in the design, fabrication, installation, inspection and testing of equipment and components comply with the requirements of applicable national consensus standards.

(2) Defense Waste Processing Facility

(a) The codes and standards used in the design and construction of the facility may not be consistent with the provisions of appropriate national consensus codes and standards.

(b) It has been acknowledged that lapses in the quality control records for the Safety Class and Associated Structures exist. Consequently, the adequacy of the construction of these buildings has not been established.

(c) The definition of the DBE acknowledges that the facility may not be usable after the DBE event. Acceptance of such a concept precludes additional use, or decommissioning and decontamination after a DBE and therefore may be unacceptable.

c. Numerous documents were requested for review during the initial visit to provide additional information on some of the questions raised during the first visit and to provide better insight into the details of the design bases employed. However, only a few of the requested documents arrived at the DNFSB offices just prior to the site visit and were not reviewed in detail. Thus, this report does not reflect the review of additional information which otherwise might supplement or clarify the observations contained herein.

d. The information reviewed by the DNFSB staff and outside experts suggests that a comprehensive, independent, third party design review of these facilities would be an efficient means of delineating potential design and construction deficiencies and developing necessary remediation efforts by the parties involved.

e. The DNFSB staff also plans to conduct a similar design bases review of the mechanical and electrical systems to determine if comparable problems exist in those areas in both facilities. This effort is planned for the fourth quarter of 1992.

6. Attachment:

Trip Reports of Drs. Hall, Rizzo and Stevenson.

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Memorandum

To: A. J. Eggenberger, A. G. Stadnik and J. Blackman
From: W. J. Hall and J. D. Haltiwanger

Re: Observations and Comments on RTF and DWPF Arising from SRS Visits on April 22,

1992, and June 10-12, 1992 Contract DNFSB-89-005 (Task 001)

Although other topics were discussed at the noted meetings, only observations and comments pertaining to the Replacement Tritium Facility (RTF) and the Defense Waste Processing Facility (DWPF) arc presented herein. In the paragraphs that follow, we have attempted to summarize the more significant of our observations deriving from the noted meetings. Although the topics on atmospheric monitoring and groundwater were presented in connection with the RTF facility, it should be appreciated that they are common in many respects to both facilities.

RTF Safety Analysis Programs and Design Standards

Early discussion was held about atmospheric modelling related to air releases. It appeared that the existing meteorological computer models for predicting (forecasting) the transport and dispersion of contaminants to and within the atmosphere were limited, a matter of some concern under the circumstances prevailing. It was reported that, compared to empirically obtained results, the model developed to this point in time works reasonably well for daytime conditions, but cannot be relied upon for night-time conditions. If, as was claimed, the model being used is the best currently available, we have no specific suggestions to make regarding improving the situation, except to urge continued efforts to improve the models, and, in the meantime, to further strengthen their predictive capabilities by expanding the empirical data base. We support development of such modelling capability throughout the DoE system, and would hope that advanced models could be adapted for use at all laboratories and facilities, where appropriate.

Discussion on this topic at the June 10-12, 1992 meeting indicated that the approach now being used in the atmospheric modelling appears not to take into account such potentially significant factors as atmospheric inversions, humidity variations, mist, fog, and rain-outs. The cognizant group agreed to look into the modelling of such factors. It was noted in the briefing that the results given by the analyses now in use are not valid at distances less than about 0.4 kilometers from the point of contaminant release. Thus an obvious question arises, namely how are dose rates for on-site personnel evaluated?

Ground Water -- The discussion on the hydrostratigraphy of the general separations area of the Savannah River Site was informative. In accordance with the information presented, the site is underlain by two primary aquifer systems (each in turn broken down into two sub-aquifer systems). We were advised that the trends and depths of the aquifers at the site are so arranged, and possess hydraulic head differences, such that contaminants that might reach them from surface spills within the site would migrate at-depth only toward streams (the "sinks") that either traverse the site or are adjacent to it. Hence, it was claimed that contaminant spills on the SRS could not pollute the groundwater systems which the surrounding communities use for their water supplies. Clearly surface spills where rapid runoff is possible, as for example the tritium spill in December 1991, could contaminate streams of the area, including the Savannah River, a matter of concern to everyone in the area affected. One can only assume that steps will be taken to preclude such spills.

We were interested to learn that no formal groundwater modelling (in the sense of modern

computer modelling programs) of the SRS had been undertaken to this time. That observation seemed unusual to us in view of the importance of the facility and the nature of its functions carried out. We have yet to learn of the details of contaminant monitoring systems for groundwater and surface runoff.

Geology -- The presentation referred briefly to the carbonate zones beneath the site in question, and emphasized the hydrostatic equilibrium that appeared to exist in such zones. These latter observations, and some connected with the former presentation, could not help but make us wonder about the channels of intercommunication of geologists and geotechnical personnel at the SRS. We hope that steps can be taken to remedy that situation.

In the June briefing deficiencies in the geotechnical investigations that have been completed to date for the RTF were identified, and it was reported that plans are being developed to make the additional borings that are required to provide the needed additional information.

Design Standards -- We congratulate the WSRC personnel on the work that they are doing in an effort to respond to earlier DNFSB concerns in regard to locating the design criteria that had been used in the design of the RTF. It is understood that these criteria pertain to earthquake, tornado and wind design bases, as well as other normal design effects (gravity loading, thermal effects, pressure, etc.). This effort to document these design criteria has not been completed, so no conclusions with regard to the adequacy of the design, or the related analyses, can yet be drawn.

Some discussion of safety classification was held as part of the briefings, and this topic needs to be pursued more thoroughly in The forthcoming discussions. Also, as a result of a tour of the facility and from the presentations and discussions, it is not clear whether or not the earthquake resistance of the entire facility, including the building and installed equipment, has been dealt with systematically. After the current effort to document the design criteria that were used for the RTF has been completed, a thorough study of their adequacy and of the consistency of their application in the design and construction of the entire facility, including the installed equipment, would seem to be in order. Such a review would seem to be especially important in light of the importance of this facility to our national defense posture.

DWPF Design Standards and Safety Analysis Programs

Of particular interest with respect to the DWPF presentations, all of which took place on June 10-12, 1992, was that concerned with the seismic design criteria and underlying philosophy. The presentation by Bechtel National, Inc., noted use of DBE and IPE seismic design criteria. We appreciate that this facility has been in the design/construct mode for better than a decade. In the case of the IPE criteria, it was learned that the design philosophy calls for the facility to be capable of resuming operation after repair and/or replacement. The DBE criteria presentation indicated that in the event of an earthquake of that size it was assumed (on the basis of the criteria presented) that the DWPF would not be useable as a production facility following the DBE event. These criteria are extremely interesting in light of the intended function of this facility, and initially raise questions in one's mind about functional goals, design of the structure and equipment, as well as equipment classification and qualification, and remediation plans following a large

earthquake. For example, what are the plans for handling of the facility and its contents following a large earthquake? What are the postulated radiation scenarios both on-site and off-site, in the event of a large earthquake?

The approach that was said to have been used to determine the safety class items for this facility were described by the statement "focuses on protection to the public from radiological consequences of facility operation." But should the focus not also include the safety of the operating Personnel? Perhaps it does, but clearly defined concern for the well-being of on-site personnel was not in evidence in the presentations made at this meeting.

While Bechtel's attention to the qualification of safety class buildings is commendable, in light of the presentation we received we have questions as to the reasonableness of the extent of their program? Unless there is reason to expect that the buildings were not designed and constructed according to appropriate codes, specifications, and/or other criteria, it seems, in light of the foregoing observations, premature (unnecessary?) to undertake the quite extensive, on-site, field test program that was presented to us in the briefing.

We conclude by commenting briefly on the lengthy descriptions of the systems analyses of different types that were interspersed as parts of the presentations. It was obvious that great amounts of funds and time were being invested in such studies with respect to the DWPF. One cannot help but wonder if the great attention to these topics might not suggest a program of change in post-construction and pre-operational functional goals as contrasted to those envisioned at the time of original design significantly more than a decade ago. We appreciate the major changes in functional goals can be expected in the present environment, and we will be interested to learn more about the new functional requirements and their relationship to the facility itself, as well as planned operational modes.

In conclusion, the foregoing observations tend to reinforce our opinion that the total program of effort with respect to the RTF and DWPF, including design criteria, functional goals, operations, as well as safety, needs to be examined by DNFSB, its staff and consultants in detail in the immediate future.

cc:
M. Flynn
P. Rizzo
J. Stevenson

M E M O

To: Mr. Andrew Stadnik Project

FROM: Dr. Paul C. Rizzo

July 21, 1992

Mr. John A. Achenbach

cc:
Dr. A. J. Eggenberger
Dr. Joel Blackman
Dr. John D. Stevenson
Dr. William J. Hall
Mr. Mark J. Flynn

TRIP REPORT DNFSB STAFF AND CONSULTANTS MEETING WITH WSRC
April 22, 23 AND 24, 1992
SAVANNAH RIVER SITE
(TASK ORDER 001)

A meeting was held by the DNFSB Staff and their Consultants with Westinghouse Savannah River Company (WSRC) Staff on April 22, 23 and 24, 1992 at the Savannah River Site. The purpose of the meeting was to address the seismic design and the design basis accidents for the Defense Waste Processing Facility (DWPF) and Replacement Tritium Facility (RTF). The following items were of special interest to the authors:

GENERAL

Establishing Safety Class Items

Throughout the WSRC presentations on the two facilities it was evident that each facility has traditionally worked independently to establish their Safety Class Items (SCI). On the morning of April 24, the WSRC and Department of Energy (DOE) management explained that this issue was presently being addressed. WSRC has written to DOE providing a proposed site wide methodology for SCI designation. This methodology employs a Frequency versus Consequence Curve based on two sets of parameters which WSRC believes to have been accepted by DOE: a dose of 25 rem at a frequency of 10(-6) events per year and a dose of 500 mrem at a frequency of 10(-2) events per year. WSRC has already begun development of the SCI list for the existing Tritium Facility utilizing this methodology, under the assumption that DOE will provide early approval of the methodology.

The application of the above methodology as addressed at the meeting raises several concerns. No information was provided as a basis for determining the shape of the curve. This fundamental point will impact all SCI, and appears to have been developed in a somewhat arbitrary manner. This is very significant with regard to determination of Design Basis Accidents (DBA), and therefore safety classification of equipment.

The WSRC proposed strategy requires DOE's immediate attention in order that time and money not be wasted on the WSRC review activities. As this strategy is apparently being implemented site wide by WSRC, the consequences of a DOE rejection might have a significant impact on both schedule and funding requirements.

Consistency of Design Philosophies

The presentations made it clear that the philosophies employed in implementing DOE Order 6430.1A and DNFSB Recommendation 90-2 were different for each facility. This is partially due to the different ages of the facilities' designs. However, different philosophies continue to be implemented even in present design reviews. One example is the design criteria of the Investment Protection Earthquake (IPE). The IPE is a design basis for the DWPF, but not the RTF. Furthermore, the IPE criteria is considerably different from Operational Basis Earthquake (OBE). Specifically, the DWPF may require repair and/or replacement of equipment due to damage sustained during an IPE. It appears that WSRC has recognized this shortcoming and is addressing it in its ongoing management reorganization. Once the new management is in place, WSRC should be requested to demonstrate that the new site-wide design criteria will be implemented in the review of completed and ongoing design activities as well as new projects.

Maximum Individual Dose for Site Workers

One of the inconsistencies in design philosophy was the exclusion of site personnel as part of the general public. The DWPF did not consider the site workers as part of the general public, and therefore has based its maximum exposure allowances as 500 mrem measured at the site boundary. However, the RTF SCIs include those items whose failure would result in exceeding 5 rem on-site.

Systems Descriptions

Due to security clearance problems with both the conference rooms and several meeting attendees, WSRC was unable to explain in detail the systems for the facilities. Such information is imperative if further evaluation of the design bases are to be performed. It is requested that a meeting be held in the appropriate location prior to any detailed review of these facilities.

DEFENSE WASTE PROCESSING FACILITY

DOE Order 6430.1A Compliance

DOE Order 6430.1A (6430.1A) was not a design basis document for the DWPF, as design and construction were nearly complete at the time the order was issued. WSRC and its contractors have performed a series of compliance reviews in order to assess the status of the DWPF with regard to 6430.1A. The reviews were initiated by United Engineers and Constructors (UE&C) and later completed by Bechtel National Incorporated (BNI). Although the process appears to have been thorough--613 of the originally screened 3613 items required further review, both UE&C and BNI were the Architect/Engineer (A/E) for the facility at the time each performed their review. No independent review of 6430.1A compliance was initiated.

Soil Modeling

Two separate presentations were made on the subject of soil modeling. On the afternoon of April

22, Mr. S. Samaddar's presentation indicated that dynamic soil properties were taken from a 1978 D'Appolonia study. On April 23, Mr. Ken Mark indicated in his presentation that the dynamic soil properties were obtained from a Geotechnical Engineers, Incorporated study, although no specific date or report number was provided by Mr. Mark. This point requires clarification by WSRC.

REPLACEMENT TRITIUM FACILITY

Seismic Design Basis

The seismic analysis of record is a Blume spectra, with a peak horizontal ground acceleration of 0.2g and peak vertical ground acceleration of 0.13g. WSRC was unable to provide any details on the Blume analysis, and in fact indicated that they did not have a copy of the Blume report. WSRC should be requested to pursue obtaining a copy of the report from Blume.

M E M O

TO: Mr. Andrew StadnikProject

FROM: Dr. Paul C. Rizzo
July 21, 1992
Ms. Jean Ann Belak

cc:
Dr. A J. Eggenberger
Dr. Joel Blackman
Dr. John D. Stevenson
Dr. William J. Hall
Mr. Mark J. Flynn

TRIP REPORT
JUNE 10 THROUGH JUNE 12, 1992
RTF AND DWPF BRIEFING AT SRS
TASK 001

A briefing was held at the SRS Site on June 10-12, 1992, regarding the status and issues for the DWPF and RTF facilities. The following presents input to your Consensus Trip Report.

EXECUTIVE SUMMARY

Neither the RTF nor the DWPF have demonstrated adequacy for safe operations.

Several current deficiencies include:

- Risk acceptance guidelines do not have a clearly documented basis and are not compatible with existing guidelines;

- Safety classification of structures, systems and components is not clear or complete, and the implementation procedure is not clear or complete;

- The System Design Descriptions are not complete, and therefore, we cannot identify safety class items; and

- A major shortfall in the RTF geotechnical information exists to the extent that start-up should be questioned.

Taken together, these deficiencies, as described in more detail below, indicate that sufficient demonstration of adequacy does not exist to justify that the DWPF and RTF will operate safely.

COMMENTS

Risk Acceptance Guidelines

The concept of Off-Site Radiological Risk Acceptance Guidelines, presented graphically for the DWPF and RTF and attached hereto, appears to be a valuable tool for assessing facility safety. However, the bases for the guidelines are not clear. For example, SEN-35-91 expressly defines a quantitative safety goal that limits the risk of cancer fatalities not to exceed one-tenth of one percent of the sum of all cancer fatality risks resulting from all other causes. If the cancer fatality rate from all other causes is 1.93E-3 fatalities per year (Tank Guidelines), then the DOE safety goal is 2E-6 (rounded) cancer fatalities per year.

The corresponding SEN-35-91 risk acceptance guideline is also shown graphically, superimposed on the DWPF and RTF curves. For frequencies from about 7E-3/yr. and above, the proposed acceptance guidelines exceed those of SEN-35-91. For example, at a frequency, = 1 E-2, the proposed guideline dose is C = 500 mrem. The calculated risk is then R = (5E-4 fatalities/rem) (Tank Guidelines) x (lE-2/yr.) (.5 rem) = 2.5E-06 fatalities/yr., exceeding the 2E-06 fatalities/yr. DOE safety goal.

Because the proposed dose limit stays constant at 500 mrem, the amount by which the calculated risk exceeds the DOE risk goal increases with increasing accident frequency. The concern, then, is that the bases of the curve are not clear, nor is it clear that all applicable existing guidelines have been appropriately considered.

Additionally, the risk acceptance curve is then used in some way to identify the safety classification of structures, systems, and components. Although this author does not disagree philosophically, the details of implementation of the concept are not clear enough for a meaningful review.

No System Design Descriptions (SDD) are reported to be available and safety related systems are not yet defined for the RTF. Therefore, documentation does not exist to assure design adequacy with respect to design requirements. For example, the standards that apply per DNFSB Recommendation 90-2 are not defined and cannot be until safety classification is completed. This

lack of fundamental documentation precludes the assurance that the design of the DWPF and RTF is adequate.

For the RTF, the safety envelope was discussed with respect to maximum calculated exposures for credible events. When considering radiological consequences on the basis of frequency of occurrence per year, one should also consider the cumulative dose (for all events) times their respective frequencies of occurrence per year (risk). Therefore, the radiological consequence of a Maximum-Individual Dose, or a single event, is not very instructive. For example, the on-site consequence for the-bounding event is shown as 7.1 E03 mrem. No conclusion can be drawn from this information. However, such a high dose can cause alarm. If the dose is multiplied by its frequency of occurrence and added to cumulative risk, its risk contribution can be evaluated against the proposed acceptance criteria.

DWPF Design Basis Earthquake

The definition of the Design Basis Earthquake (DBE) does not appear to be consistent with this author's philosophy, especially with respect to requirements for decontamination and decommissioning following a safe shutdown event. At issue is the definition of "safe shutdown" and the requirements to maintain the facility in the safe shutdown condition. It is our current understanding that in the event of a DBE, the facility will not be in such condition that it can be entered for purposes of hazard assessments, decontamination and decommissioning. In other words, it would appear that the DOE simply plans to abandon the facility. If so, we would strongly recommend that the DNFSB pursue an "attitude adjustment" on this matter.

DWPF SAR Revision

The DWPF SAR, Chapter 9 Accident Analysis, does not yet reflect the results of the effort to identify safety class items, discussed above. It should be revised for this purpose.

DWPF Building Factors of Safety

For the DWPF Building Design Review, Mr. M. Wrona committed to providing actual factors of safety, not just the minimum acceptable values.

RTF GEOTECHNICAL INFORMATION

A major shortfall in geotechnical information was described. This writer is wondering how a SAR and SER could be issued and DOE Order Compliance could be assessed without such basic information. The matter is such a major deficiency that start-up of the RTF in the near future should be questioned as it is doubtful that sufficient information could be obtained, digested and reviewed in any time period less than about six months to a year. Further, such a situation causes significant doubt regarding the credibility of the entire program to assure the adequacy of the RTF to operate safely.

RTF SEISMIC TRIGGER LEVEL

For the Seismic Detection System, it is unclear what the seismic sensor trigger level is for the seismic isolation valves, and the criteria for specifying and defending the level. Westinghouse agreed to document this matter.

RTF Dispersion Analysis

In the discussion of dispersion modeling, it was pointed out that the calculated 0.5 percentile values were high by a factor of 1.7 to 3.5 compared to measured values. This is interesting, but the writer cautions that taking credit for this overprediction other than in the 0.5 percentile range is not satisfactory. Results of similar comparisons at the 50th percentile were not reported, and cannot be assumed to be the same.

REFERENCES

DOE Draft White Paper, "Risk Acceptance Guidelines for High-Level Waste Storage Tank Farms," February 14, 1992, [Tank Guidelines, DNFSB No. 92-0001051].

Figure 1. Proposed Office Radiological Risk Acceptance Guidelines not provided

91C1650A(2)
MEM05.5

To: Mr. Andrew Stadnik

DATE: July 15, 1992

FROM: Dr. John D. Stevenson

cc: Dr. A.J. Eggenberger
Stevenson and Associates
Dr. Joel Blackman
Mr. D. Burnfield
Mr. D.C. Lowe
Ms. Cindy Fleenor

TRIP REPORT ON MEETINGS
WHICH PRESENTED THE DESIGN CRITERIA
FOR THE REPLACEMENT TRITIUM FACILITY (RTF)
DEFENSE WASTE PROCESSING FACILITY (DWPF), AND
TRITIUM FACILITIES (TF)
SAVANNAH RIVER SITE
22 - 24 APRIL 1992
(DNFSB TASK 0RDER 001)
(REISSUE)

1.0 REFERENCES

At the meeting the following reference material was presented:

A. Applicable to All Three Facilities

(1) Meteorology at SRS
(2) Seismology for RTF, DWPF and TF
(3) Soil Data and Design Bases for Earthquake, Wind and Tornado for DWPF, RTF, and TF

B. Replacement Tritium Facility (RTF)

(1) RTF Startup Test Program Purpose
(2) Summary of RTF Accidents
(3) 6430.1A Compliance Reviews
(4) Hazard Classification Matrix
(5) DOSE Assessment Methodology
(6) Earthquake Design
(7) Design Basis and Functions
(8) Overview of Replacement Tritium Facility (RTF) - Structural Analysis and Design Criteria
(9) Major Design Requirements
(10) Equipment Design Standards
(11) Equipment Seismic Qualification
(12) RTF Facility Ventilation System
(13) Electrical Power System
(14) RTF Stripper System
(15) RTF Quality Assurance Industry & Site Standards
(16) RTF Operation, Maintenance, and Decommissioning

C. Tritium Facility (TF)

(a) Tritium Complex
(b) Conformance with DOE Order 6430.1A and Industry Standards
(c) Candidate Safety Class Items
(d) Design Basis for Earthquake, Wind and Tornado
(e) Electrical Power Distribution System
(f) Process Status
(g) Ventilation Systems

D. Defense-Waste Processing Facility (DWPF)

(h) Defense Waste Processing Facility Division
(i) Compliance Review versus DOE Order 6430.1A

(j) Designation of Safety Class Items (SCI's)
(k) Principal Design Codes
(l) Seismic Qualification of Equipment
(m) Design Basis for DWPF Structures
(n) Electrical Distribution System
(o) HVAC System
(p) Melter Offgas System

2.0 DISCUSSION OF SITE PARAMETERS

The site related presentations on Meteorology, Seismology, Hydrology and Local Geology were consistent with similar previous presentations for the site except it was noted that their night time meteorology was not well modeled analytically. This aspect of dose estimation appears to need further study.

3.0 REPLACEMENT TRITIUM FACILITY (RTF)

3.1 General

This facility is in the final stages of construction and startup and is expected to go into operation next year. For the most part safety classes are limited primarily to vessels and structures which contain relatively large quantities ofú tritium in a transportable form such that an accidental release could result in a SRS offsite dose in excess of 500 mrem. The contractors (Westinghouse, Bechtel) also appear to have set a limit of 25000 mrem at the H facility boundary (within the site) as a criteria for developing the list of safety class components. No credit is taken for mitigating systems such as ventilation or emergency power supplies in the accident analysis, hence, these are not considered safety related. The failure of other process systems components results in releases less than 500 mrem at the SRS boundary or 25000 mrem at the facility boundary, hence they are also not considered as safety related. There appear to be some items which are not safety related but serve a monitoring function such as the seismic trigger and stack monitors which are seismically qualified but have not been designated as safety class.

It does not appear that the contractors have considered radiological input to personnel within the facility in developing their safety class items. Contrary to commercial practice they also have not provided mitigating or process safety systems such as emergency power, ventilation or cooling systems any level of earthquake, tornado, etc., design protection.

3.2 Observations

In my opinion there is a strong need to review the function and the associated safety classification of all process and auxiliary support, accident mitigation, and facility safety systems and components. The determination of safety class should be consistent with the components function in limiting radiological dosage for on-site and in-facility personnel. Also the systems and components should be reviewed for classification for enhanced ability to withstand external events such as earthquake and extreme wind in a manner similar to that being used at the Hanford site in

the design of new waste tanks. The Hanford procedure uses a graded approach where safety related systems and components which are not identified as safety class using current DOE definitions are identified and designed for reduced levels of external loads associated with the moderate and low hazard designation currently contained in UCRL-15910.

4.0 TRITIUM FACILITY (TF)

4.1 General

The tritium facility was originally constructed over thirty years ago and it appears that no structures, equipment or distribution systems were designed to resist external events (earthquake or extreme wind) beyond that required by applicable conventional building codes. There has been some limited evaluation of existing buildings to resist site defined earthquake and tornado effects with varying results with regard to these structures being able to carry the postulated loads.

In general the tritium facility has used the same procedures a the RTF in identifying safety class structures and components except they appear to have used a sliding scale of site boundary radioactivity release as a function of postulated event frequency as shown in Figure 1 attached. They have concluded on this radiological release basis there is no reason to evaluate the facility for site earthquake or tornado loads.

4.2 Specific

My reaction and observations on the Tritium facility are the same as stated in Section 3.2 for the RTF.

5.0 DEFENSE WASTE PROCESSING FACILITY (DWPF)

5.1 General

This facility like the RTF facility is in the final stage of conStruction and startup and is expected to go into operation within one year. The development of safety class designations has followed in general the same procedures as used on the RTF facility with some important differences. The DWPF appears not to have considered radiological dose effects to personnel on site or within the facility when determining Safety Class (see Figure 2). Also during the design of the facility an Investment Protection Earthquake, IPE, was identified for the design of many components. The IPE has a magnitude one half of the Design Basis Earthquake, DBE. As a result many components within the DWPF are seismically qualified to what would be termed a moderate hazard level as currently defined in UCRL-15910.

5.2 Observations

My observations for the DWPF are the same as stated in Section 3.2 for the RTF.

6.0 SUMMARY

6.1 Material Presentation

The materials presented relative to all three facilities, the DWPF, RTF and TF were quite qualitative in nature. The material tended to concentrate on the presenting of design requirements as determined by accident or hazard analysis and as presented in the applicable SAR in conformity only with the letter of current DOE requirements. The contractors appeared to provide little technical input beyond referencing applicable DOE orders and criteria. The perception was left that the contractor emphasis is on the statistics of compliance with DOE orders rather than the development of design criteria. The major thrust of their efforts appears to be to minimize the number of components which would be defined as Safety Class and to consider all other items as commercial grade and applying only conventional facility construction requirements to those items.

It should be noted that if the psychology of considering boundary dose only as the parameter for safety classification what consideration is being given to common failures? An earthquake or an extreme wind which effects all three facilities and could cause releases from all three facilities has apparently not been considered in their safety evaluation of the individual facilities.

6.2 Relation to Commercial Nuclear Design Criteria and Standards

The safety analysis performed on all three facilities concentrated almost solely

My reaction and observations on the Tritium facility are the same as stated in Section 3.2 for the RTF.

The safety analysis performed on all three facilities concentrated almost solely on radiological dose as the determination of a single safety class and requirements for extreme external load design. Even in this case at TF no seismic or tornado design requirement was identified even for safety class components. There appears to be little consideration given to the 4 levels of safety classes currently defined in commercial nuclear facilities (ANS 51.1 and 52.1). As a result a relatively small number of building structures and equipment (primarily large tanks or vessels) are identified as safety class. Essentially no consideration (with a few exceptions in the RTF) has been given to external extreme load (seismic, extreme wind) analysis of instrumentation, monitoring or control systems, accident mitigation systems, and facility safety systems associated with emergency power, emergency cooling, emergency ventilation or fire protection systems.

6.3 Topic Areas Requiring Emphasis in Future Reviews

(1) For all three facilities there should be a comprehensive review and development as necessary of a design basis for all buildings, structures, systems and components in the facilities which employ the four hazard categories and design requirements as currently contained in UCRL-15910. The approach recently applied to new waste tank designs at Hanford might form the basis of such categorizations. (See Attachment A.)

(2) Safety classification(s) for all facilities should include an evaluation of not only site boundary radiological doses but also radiological doses at the facility boundary, within the site, and within the facility.

(3) An evaluation of all buildings, structures, systems and components should be undertaken at least on a sample basis to demonstrate compliance with the final design basis.

(4) The RTF and TF project organization should understand that UCRL-15910 as identified in DOE Order 6430.1A also applies to equipment and distribution systems as well as buildings. They seem to be using an incorrect assumption that its application is limited to buildings only.

(5) The DWPF, RTF and TF projects need to identify what codes and standards will be used during inservice inspection, operation and maintenance of their facilities. Specifically will ASME Boiler and Pressure Vessel Code Section XI requirements be used for inservice inspection of pressure retaining components and the ASME O&M standards be used for operations and maintenance?

Please advise if you desire any clarification of this trip report.

Figure 1, Frequency vs Consequence Curve for Candidate Safety Class Items not provided

Figure 2 (DWPF), Probability vs Dose not provided

Attachment A

Project 93-D-183 (W-236)
Multi-Function Waste Tank Facility

Safety Class General Definitions

Safety Class 1

- Systems, components, and structures, including portions of process systems, whose failure could result in offsite public exposure beyond threshold limits (.5R)

Safety Class 2

- System, components, and structures, including portions of process systems, not defined as Safety Class 1 whose failure could result in exposure for the onsite worker beyond threshold limits (5R)

Safety Class 3

- Systems, components, and structures, including portions or process systems not defined as Safety Class 1 and 2 whose failure could preclude implementing the ALARA policy.

TO: Mr. Andrew G. StadnikDATE: July 16, 1992

FROM: Dr. John D. Stevenson

cc: Dr. A.J. Eggenberger

Stevenson and Associates
Dr. Joel Blackman
Mr. D. Burnfield
Mr. D.C. Lowe
Ms. Cindy Fleenor
Dr. Paul C. Rizzo
Dr. William J. Hall

TRIP REPORT ON MEETING DISCUSSING THE DEFENSE WASTE PROCESSING FACILITY (DWPF) AND THE REPLACEMENT TRITIUM FACILITY (RTF) SAVANNAH RIVER SITE 10-12 JUNE 1992 (DNFSB TASK 0RDER 001) (REISSUED)

1.0 INTRODUCTION

Attachment A contains a copy of the agenda for these meetings. The primary areas reviewed during the visit were the current design basis for the RTF and DWPF facilities.

2.0 SAFETY CLASSIFICATION OF STRUCTURE, EQUIPMENT AND DISTRIBUTION SYSTEMS

The DOE contractors (Westinghouse, Bechtel) for the RTF and DWPF facilities are currently developing very limited lists of Safety Class Structures, Equipment and Distribution Systems. The basis for this classification is only the off-site radiological dosage limits. Such Safety Classification does not at the present time consider the radiological consequences to on-site or in facility personnel. Also, it is my observation that this approach is not consistent with current commercial nuclear experience. Attachment B contains a list of typical safety - related equipment which covers items at commercial nuclear power plants which are not related to reactor operation. This includes fuel storage and waste treatment systems. Comparing this list to typical DOE contractor developed safety class lists suggests the DOE Contractor Safety Classifications for non-reactor components are not consistent with those at current commercial nuclear facilities.

The presentations indicate the DOE contractors are considering the use of on-site and in facility radiation doses to define safety classes (i.e. 5-25 REM for onsite up to 300 REM for in facility) but no guidance on this issue has come from DOE headquarters.

Currently the RTF and DWPF facilities have four classes for design with only Class 1 considered Safety Class. Within the DWPF the facility only the external structures and supports are considered as Safety Class (Class 1). However, for the RTF facility in addition to the structures which house them, several tanks and isolation valves are considered Safety Class (Class 1). Safety Class structures and components in both facilities are designed for a 0.2g ZPGA earthquake (seismic level) and a 230 mph tornado. The DWPF is also designed for a facility investment protection earthquake having a 0.11g ZPGA. This earthquake (IPE) is used as the design basis for certain equipment, certain cranes and some embedded piping.

3.0 SAFETY CLASS INCONSISTENCY WITH OTHER DOE SITES

As previously discussed the design classification for the RTF and DWPF structures at SRS uses four classes, one safety class and 3 non-safety classes. This approach contrasts with Hanford which is also using four classes but at Hanford there are three safety classes and one non-safety class. In my opinion the Hanford Safety Class system is the more rational approach to system and component classification for construction.

Attachment B

ATTACHMENT B

PRINCIPAL STRUCTURES. SYSTEMSANS AND COMPONENTS

1. Fuel Pool Cooling and Clean-up

    a. Spent Fuel Pool and Liner2ACI-349
    b. Spent Fuel Pit Heat Exchanger3ASME III, Class 3
    c. Spent Fuel Pit Pump3ASME III, Class 3
    d. Refueling Water Purification Pump3ASME III, Class 3 (one pump only)

2. Waste Processing System (Liquid Sub System)

    a. Reactor Coolant Drain TankNNSASME III, Class 3
    b. Reactor Coolant Drain Tank PumpNNSASME III, Class 3
    c. Reactor Coolant Drain Tank Heat Exchanger. (Shell Side) 3 ASME III, Class 3
    d. Waste Holdup Tank 3 ASME III, Class 3
    e. Waste Evaporator Feed Pump 3 ASME III, Class 3
    f. Waste Evaporator Feed Filter 3 ASME III, Class 3
    g. Waste Evaporator 3 ASME III, Class 3

h. Waste Evaporator Condensate Tank Pump NNS ASME III, Class 3
i. Chemical Drain Tank Pump NNS ASME III, Class 3
j. Spent Resin Storage Tank 3 ASME III, Class 3
k. Spent Resin Sluice Pump 3 ASME III, Class 3
l. Spent Resin Sluice Filter 3 ASME III, Class 3
m. Laundry and Hot Shower Tank Pump NNS ASME III, Class 3
n. Floor Drain Tank Pump NNS ASME III, Class 3
o. Waste Monitor Tank Pump NNS ASME III, Class 3
p. Gas Compressor 3 ASME III, Class 3
q. Gas Decay Tanks 3 ASME III, Class 3
r. Hydrogen Recombiner 3 ASME III, Class 3