

Evading the Issues:
A review of the August 2008 Report to the U.S. Congress about safety regulation at the U.S. Department of Energy's Hanford Waste Treatment Plant.

By

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On August 12, 2008 the U.S. Nuclear Regulatory Commission (NRC) released a report requested by Congress which concluded that “*the regulatory processes for [the U.S. Department of Energy's] Waste Treatment Plant at the Hanford nuclear reservation in Washington state, if properly implemented, are adequate to ensure public health and safety.*” This judgment was rendered even though the NRC failed to determine if more than two dozen significant safety concerns it raised about this project in 2001 have been resolved by DOE.

The Hanford Waste Treatment Project is considered to be the largest, most expensive and potentially risky nuclear cleanup project ever undertaken in the United States. Estimated life-cycle costs for processing Hanford's wastes are between \$41.6 and \$56.9 billion. There are 54 million gallons of these wastes stored in 177 large underground tanks at the site. One third of the tanks have leaked.

The consequences of a major accident at the Waste Treatment Plant are comparable to those resulting from a severe nuclear power melt down or a reactor spent fuel pool fire. Unlike a nuclear power reactor the WTP will not have a thick concrete containment structure to prevent the escape of large amounts of radioactivity into the environment. A major accidental release of radioactivity from the WTP could result in potentially lethal doses to the workers and public and create widespread land contamination. The risks of such accidents are less certain than for power reactors because the WTP is a first-of-a-kind facility. No country has processed anything quite like Hanford's large and complex brew of wastes.

The report was prepared at the request of the U.S. Congress, after safety problems emerged at the Hanford facility over the past several years. Numerous safety concerns were raised by NRC staff in a June 2001 (NUREG 1747); after the DOE decided terminate its relationship with the Commission. Between 1997 and 2001, the NRC was involved in establishing independent safety regulation of the project under an NRC license. The NRC identified over 28 significant issues and more than 50 specific topics in the design and safety approach adopted by the DOE. However, the DOE decided to end

this relationship. DOE self regulates nuclear safety primarily through contract clauses. By comparison the NRC regulates through promulgated standards, enforced through fines and other penalties.

In particular the NRC concluded that the “safety envelope” for the WTP was inadequate. A high degree of conservatism is required to encourage safety margins that can envelop uncertainties inherent with first-of-a-kind, hazardous operations. Instead NRC reported that DOE and its contractors were cutting corners on safety to meet schedules. Unless several steps were taken to mitigate potential dangers, the NRC estimated that there was a 50/50 chance that of major radiological and chemical accidents at Hanford’s high-level waste operations.

Despite its conclusion that the Energy department safety regulation of the Waste Treatment Plant is “adequate,” the NRC chose not to deal with several of its own key unresolved safety concerns –claiming that they are “outside of the scope” of its review. (See Appendix) For example:

- The DOE never properly accounted for the numerous safety concerns raised by the NRC in 2001 and did not include them in its Corrective Action Tracking System. The DOE only provided a response this year as an appendix of the report. However, the NRC did not determine if DOE has satisfactorily resolved numerous concerns raised seven years ago, claiming it was “outside of the scope” of its review.
- Several specific safety issues were raised by the NRC staff after visiting the Hanford project this year, such as potential, risks of hydrogen explosions, worker exposures, the inability repair and maintain equipment in high radiation areas, accident risks from corrosion of key components, and chemical accidents. However, NRC did not review these issues because they also “fell outside of the scope and intent of this review.”
- No mention was made by NRC and DOE in this recent report about of the risks posed by Hanford’s high-level waste tanks, which are an essential element of the safety regime for the Waste Treatment Plant. In 2001, the NRC concluded that the waste tanks “represent immediate concerns...thereby increasing the likelihood of tank leaks and accidents.” Many Hanford’s tanks are larger than most state capitol domes and over 60 years old. The wastes in these tanks generate potentially flammable and explosive gases. More than one third of the tanks have leaked – posing a threat to the Columbia River.
- In 2001 the NRC concluded that consequences of a major accident at the Waste Treatment Plant would be comparable to a severe reactor melt-down. The NRC also found that the WTP could be vulnerable to explosions and fires that could result in catastrophic releases. In 2001 the NRC estimated that the risks of such an event could be as high as 50/50 during the operation of the plant. NRC chose not to address this issue in its recent report.
- The Waste Treatment Plant could be vulnerable to chemical accidents and large chemical releases. In 2001, NRC staff reported that a potential rupture of

chemical storage tanks containing ammonia and nitric acid would prove lethal beyond a mile and make the plant uninhabitable. In 2008, after visiting the project the NRC repeated its concern about large chemical releases, which the NRC and DOE have not commented on.

- DOE lacks a formalized system to review criticality safety at the Waste Treatment which could create a serious safety deficiency. Large amounts of fissile materials are present in the Hanford Wastes, including 1000 kilograms of plutonium. If waste processing were to result in the accumulation of these fissile materials in relatively small quantities, large bursts of energy and radiation could occur, also known as a nuclear criticality.
- DOE is pursuing a “design/build” strategy for a largest first-of-a kind ultra hazardous nuclear facility. Because of the potential flammability of the wastes, a key safety issue is fire protection. NRC’s most recent report, echoes a more detailed set of concerns expressed in its 2001 report that fire safety is being subordinated to programmatic demands to meet deadlines.
- DOE standards are less protective. Even though potential vitrification accidents “show a significant distance effect,” DOE’s assumes that Hanford’s current security perimeter of 6.8 to 9.3 miles (11,000 to 15,000 meters), will indefinitely serve as the boundary for public exposures. To be more protective, NRC’s guidance, which sets the public dose, including collocated workers. DOE continues to hold onto an outdated Cold War-era standard that could put hundreds of workers not involved with the treatment plant at greater risk.
- DOE’s efforts to shrink the site boundary affect the safety design of the plant. Over coming years, DOE plans to lift radiological controls over large swaths of the Hanford site for transfer to the U.S. Interior department’s Fish and Wildlife Service. The transfer is intended to reduce DOE overhead expenses, while expanding the Hanford Reach National Monument. In 2003 DOE stated that more than 87 percent of the land DOE currently occupies will be shifted to Interior opening public access for thousands of people.

Conclusion

The Nuclear Regulatory Commission has evaded its responsibility to address several serious safety concerns it raised in 2001 about the Hanford Waste Treatment Plant, which have not yet been resolved. Instead the Commission appears to have marginalized significant safety concerns of its own staff and has narrowly defined its review into a bureaucratic exercise that papers over numerous problems, without adequate verification. NRC is careful to note that it did not attempt to resolve the concerns it raised in the past. Nor is the NRC willing to stand behind the claims made by DOE in this report that these problems have been adequately addressed. Moreover the NRC’s review diminishes the importance of safety at the nation’s largest and potentially most risk nuclear cleanup project.

**COMPARISON OF NUREG 1747 WITH NRC'S REVIEW OF DOE'S
REGULATORY PROCESSES FOR HANFORD WASTE TREATMENT PLANT**

NRC 2008

NUREG 1747 (2001)

**DOE REPOSE TO
NUREG-1747**

<p>FOLLOW UP ON NUREG-1747</p> <p>Due to the scope of NRC's review, the NRC did not assess or inspect the resolution status of the over fifty specific topics in the Hanford Waste Treatment Plant (WTP) design and approach that required further efforts and analysis (NRC, 2001). NRC has not attempted to assess whether DOE's information in Table A.1 is responsive to the issues raised by NRC. An effort to assess whether DOE's information provided in Table A.1 is responsive and resolves the significant issues raised in NRC's report (2001) would require substantially more time and funded resources than used in this study.</p> <p>A report summarized NRC's participation in, and observations on, the DOE program, and identified issues from NRC's perspective (NRC, 2001a). NRC staff identified over 28 significant issues and over 50 specific topics in the design and approach that would require further efforts and analysis to achieve adequate closure.... When NUREG-1747 (NRC, 2001a) was issued in 2001, DOE did not enter the items from NUREG 1747 into CARS, or other previous corrective action tracking systems. p 2</p>		

<p style="text-align: center;">NRC STAFF ISSUES (Appendix B)</p> <p>Several specific safety and regulatory issues were identified during staff visits to the WTP site, discussions with DOE personnel, and reviews of WTP documentation. These issues are summarized in the table below. Although NRC staff considered these issues during their review, a detailed study was not performed because the issues fell outside the scope and intent of this review. As of the completion of this review, these issues had not yet been resolved. We believe our observations may assist the DOE in continued oversight of the WTP project.</p> <p>Hydrogen Flammability and Explosion Concerns</p> <p>The waste treatment process generates hydrogen as a result of radiolysis and other chemical reactions within the waste. The concern is the collection of hydrogen in system piping and providing a viable means of limiting the effects of a possible hydrogen explosion.</p>	<p>Hydrogen and Flammability Explosion Concerns</p> <p>Although there were numerous fire protection comments generated during the Standards approval Package (SAP) and the Initial Safety Analysis Report (ISAR) reviews, most of these comments were concerned with clarifications or omission of details. The design had not yet progressed to a point where an actual description of explosion control systems could be developed and reviewed against our existing review criteria. From these reviews comments and questions were raised concerning:</p> <ol style="list-style-type: none"> 1. Flammable Gases in waste receipt tanks. 2. Presence of ammonium nitrates and organic vapors in melter effluents. 3. Buildup of ammonium nitrate in offgas system ducts and filters. 4. Capacity and reliability of passive hydrogen venting system. 5. Monitoring of hydrogen and 	<p>Hydrogen and Flammability Explosion Concerns</p> <p>NUREG 1747 (NRC, 2001) relates the status of investigation of explosive hazards at the time of NRC involvement in 2001. The concerns identified by the NRC were also identified by DOE as needing resolution. This topic was thoroughly explored in the review by DOE of the initial PSAR in 2003 and in the review of subsequent PSAR updates in 2004, 2006, and 2008 and was, and will be, documented in the respective SERs. Although most issues related to explosive hazards (in particular, steam explosions, nitrate-organic reactions, and sugar dust explosions) have been resolved, resolution of credible hydrogen explosions due to radiolysis and thermolysis is still incomplete. An extensive review and subsequent series of design</p>
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<p>Inspection and Maintenance of Structures and Components in Black Cells—</p> <p>The Hanford WTP design makes use of “black cells.” Black cells are equipment vaults that are sealed to prevent personnel access due the existence of very high radiation levels once radioactive processing begins. This inaccessibility appears to be contrary to DOE implementing standards that require the performance of periodic inspections and maintenance of equipment and</p>	<p>other flammable gases.</p>	<p>changes to reduce significant work is in progress to address the “hydrogen in piping and ancillary vessels (HPAV)” hazard. As a result of these design changes and new operational administrative requirements, explosions in vessels are prevented, but, in a few instances, rare explosions in small diameter piping are not planned to be prevented, but will be mitigated by design features (such as thicker, stronger piping). Such explosions are considered extremely unlikely, but may still occur once or twice in a stagnant section of piping in the plant, using conservative assumptions. To ensure adequate safety in such cases, ORP has established criteria that any hydrogen explosions not produce inelastic deformation of piping. ...Final confirmation of the design and safety management systems for explosive hazards will occur with the review and approval of the Documented Safety Analysis, which is required to be submitted one year before the start of cold testing.</p> <p>Inspection and Maintenance of Structures and Components in Black Cells—</p> <p>Inspection features required in the design are developed in the Contractor hazard analysis process, and described in the PSAR. DOE subsequently reviews and approves the PSAR. Designs are reviewed in integrated safety management meetings (a broad cross-disciplinary review) to ensure that inspection features are</p>
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<p>structures, including those likely to be within black cells.</p>		<p>established where appropriate. The plant is designed such that "black cells" -- those cells that cannot be entered after hot operation commences -- have only passive components in them that are designed to not require maintenance for the life of the facility. Other, normally inaccessible areas are designed with maintenance ports, cameras, manipulator ports, or viewing shield windows so that equipment in the cells requiring maintenance can be inspected and maintained. Equipment outside black cells is accessible for inspection and maintenance. Active components outside black cells have surveillance requirements associated with them as required by the SRD (BNI, 2007a).</p>
<p>Materials Issues Regarding Corrosion and Erosion</p> <p>Tank waste consists of chemicals and solid particles and the processing of waste introduces more chemicals that may exacerbate the effects of corrosion and erosion. The concern is that the waste treatment system and other systems relied on for safety need to be adequately designed, tested, and maintained to account for these effects.</p>	<p>Materials Issues Regarding Corrosion and Erosion</p> <p>The appropriate selection of materials of construction and their inservice corrosion/erosion performance monitoring impact the safety of the facility primarily from the perspective of adequate confinement of radioactive materials, Both general and specific corrosion/erosion are likely to occur over the Tank Waste Remediation System (TWRS) operating lifetime of some 30-plus years. Potential areas of the TWRSPrivatization (TWRS-P) facility where corrosion/erosion induced loss of confinement could result in the potential for radiation exposures exceeding regulatory</p>	<p>Materials Issues Regarding Corrosion and Erosion</p> <p>NO COMMENT</p>

<p>Ammonia Related Accidents and Chemical Interactions –</p> <p>The waste treatment process utilizes anhydrous ammonia. The potential hazardous aspects of the storage and use of this material (e.g., flammability and explosive considerations, effects of storage tank failures, etc.) do not appear to have been included and evaluated in the documentation.</p>	<p>limits have been identified as follows:</p> <ol style="list-style-type: none"> 1. Tanks. 2. Pressurized transfer piping. 3. Pump seal areas. 4. Melters. 5. Melter offgas treatment areas. <p>Ammonia Related Accidents and Chemical Interactions –</p> <p>A potential rupture of cold chemical storage tanks containing ammonia and nitric acid would have onsite and offsite effects exceeding Emergency Response Planning Guideline-3 levels and require evacuation of the facility.... the potential ammonia and nitric acid releases would result in irreversible, deterministic health effects around the TWRS-P facility and its environs, and would render the facility uninhabitable for operating and control purposes. If liquid anhydrous ammonia were used, the affected area could extend out beyond a mile... Properties and Concerns of Ammonia: Ammonia is the number one chemical involved in accidents reported under the EPA's risk management program for high risk industries... A break in the ammonia supply line to NOx abatement system could, therefore, result in a release of around 16.5 cfm of ammonia gas (at room temperature), and would require about 55,000 cfm of air to adequately dilute the ammonia to below the IDLH value of 300 ppm. This accident scenario, which could constitute a significant toxicological hazard to the facility worker, has not been considered in the Waste Treatment Plant Chemical Hazards report.</p>	<p>Ammonia Related Accidents and Chemical Interactions –</p> <p>NO COMMENT</p>
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HLW TANKS	HLW TANKS	HLW TANKS
<p>The DOE Hanford Site has more than 200 million liters (53 million gallons) of radioactive and chemically hazardous waste materials stored in 177 underground waste storage tanks. These tanks contain the chemical contents from processing spent nuclear fuels for more than 40 years at the site. NRC 2008, P 10</p>	<p>NRC evaluations indicate the tanks represent a significant source term for leakage, spill, misrouting, and external event accident scenarios. In addition, they will contribute to operations and maintenance activities at the facility (e.g., for pumps, instrumentation, agitators, sampling, breather filters, etc.). The NRC would anticipate that there would be safety controls associated with this large tankage. The presence and identity of these controls is not apparent in the FFP submittal and related documentation. NUREG 1747, p 193</p> <p>The tanks also represent immediate concerns. Steel tanks that were built upwards of 55 years ago to a design life of 10 years ultimately will fail. The collapse of tanks due to overburdened loads, perhaps under seismic excitation, while they still contain waste represents both an immediate public concern and a long-term remediation challenge. NUREG 1747 p. 249</p> <p>The resources that support safety operation of the vitrification plan and the tanks are both drawn from the same source (i.e, public funds) and are, therefore, ultimately in competition with one another. DOE.s concern is that the risk of the deteriorating tanks is increasing as the tanks continue to age thereby increasing the likelihood of tank leaks and accidents. Approximately 25 percent of the tank farm equipment fails upon demand. Therefore, this issue is directed toward the DOE observation that</p>	<p>NO COMMENT</p>

	<p>regulatory oversight needs to be applied to the vitrification plant and the tanks in such a manner as to minimize the overall risk from both. This could be done by providing a consistent regulatory framework for all parts of the TWRS/WTP program.the tanks and the vitrification plant. NUREG 1747 p. 250</p> <p>From the perspective of DOE, focusing financial resources and NRC regulatory attention on the vitrification facility alone could result in insufficient consideration of the considerable environmental and public risk posed by continued operation of the tanks with their associated Leakage and potential for collapse and explosion. NUREG 1747 p.253</p>	
<p>GENERAL SAFETY ISSUES</p> <p>However, there are a number of noticeable differences between the regulatory approaches and processes. These include the following areas:</p> <ul style="list-style-type: none"> • The DOE regulatory process does not require the same level of process-safety integration review for changes to the authorization basis as NRC would require. • The DOE regulatory process allows, subject to DOE safety review and approval, process changes to be made for production and schedule purposes. • The regulatory process also allows flexibility for the contractor to implement nonsignificant changes without prior DOE approval. These changes are, however, reviewed monthly by DOE. • The DOE regulatory process allows the contractor to initiate a deviation to 	<p>GENERAL SAFETY ISSUES</p> <p>(1) Influence of Programmatic issues on safety regulation</p> <p>The influence of programmatic issues (including cost, schedule, and capacity) upon the regulatory review activities: Many design changes were made to accommodate this emphasis on cost and schedule. However, the safety analyses do not appear to have reviewed the potential impacts from such higher throughputs or additional/larger facilities. The emphasis also appeared to contribute to the deferral of some issues to subsequent reviews in order to maintain the schedule. Thus, the design work often continued with the potential for less than adequate consideration and closure of regulatory issues, such as ALARA (as low as reasonably achievable) p.xii</p>	<p>GENERAL SAFETY ISSUES</p> <p>(1) Influence of Programmatic issues on safety regulation</p> <p>The management of the WTP by DOE necessarily includes frequent consideration of cost and schedule. Given the large cost of the facility, and the limitations in the cleanup budget allocated by Congress to this project, this is one of DOE’s responsibilities. However, from the outset, DOE has provided dedicated staffing and resources to conduct the safety reviews and inspections required to ensure the WTP is adequately safe when it operates. Most importantly, within DOE, from the Secretary of Energy, to the Project Manager for the WTP, all of the direct line managers for the WTP recognize</p>

<p>the authorization basis provided that the contractor complies with the authorization-basis change process described in Table 3.3.</p> <ul style="list-style-type: none"> • The DOE regulatory process has no separate and independent regulatory and chemical safety organization within the ORP. ORP staff for regulation and chemical process⁴⁶ safety is relatively small and has competing owner (e.g. routine design and flow-sheet reviews) responsibilities. • The regulatory process may not be adequately considering and evaluating environmental and dynamic effects associated with chemical-process safety. • The DOE regulatory process allows consideration of costs and schedule. Cost and schedule are not explicitly included in the NRC regulatory process. • The DOE chemical-process-safety approach includes all aspects of chemical safety, whereas the NRC regulations focus on chemical safety associated with licensed radioactive material processing. OSHA has the regulatory authority for chemical safety not affecting licensed radioactive materials at NRC-licensed facilities, and EPA (or designated State) has regulatory responsibility for offsite chemical safety. • The DOE regulatory process uses chemical-consequence levels that are different than NRC criteria. • The DOE regulatory process has a co-located worker receptor category; 		<p>that adequate nuclear, radiological, and process safety of the WTP is essential and must be achieved. To that end, initially, in the privatization phase, a dedicated, large Regulatory Unit with the single purpose of nuclear and radiological safety oversight was chartered and staffed. With the end of privatization, this Regulatory Unit was reorganized into an independent Office of Safety Regulation within ORP in 2001-02. The DOE charter and resources for the Office of Safety Regulation were comparable to those provided by the Regulatory Unit. This organization conducted the initial construction authorization reviews of the PSAR in 2002-03. These reviews were very extensive. Subsequently, as the preliminary design has matured, fewer resources have been required to review and approve evolutionary changes to the original design, and dedicated resources have slowly been reduced as the work necessary to conduct these reviews has diminished. Throughout, DOE has ensured selected personnel are only tasked with ensuring adequately safety of the design of the facility. In addition, DOE has assigned significant numbers of field inspectors and Facility Representatives who have assurance of construction safety as one of their principal responsibilities, with neither cost nor schedule a principal responsibility. Finally, other project personnel consider cost, schedule, and safety in their assignments.</p>
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	<p>(2) Maintenance of design/authorization basis Throughout most of the design effort (about 2 years), the design and safety teams of the Contractor (BNFL Inc.) worked quasi-independently, partly because of the previously mentioned emphasis on schedule. This led to inconsistencies between the design and the safety documentation. Changes in fundamental aspects of the design occurred in this time period, potentially without adequate consideration of regulatory needs, such as inventories and source terms for the safety analyses. The design and authorization basis documents were not updated and few amendment requests were submitted to the RU. Ultimately, the RU delivered a Corrective Action Notice (CAN) on this concern in March 2000, which, in turn, led to a Corrective Action Plan (CAP) that was agreed to between the RU and the Contractor. A significant number of amendment requests were received by the RU from the Contractor after the CAN. However, by this time, most of the preliminary design activities in this phase of the program were completed and this timing of the CAN provided little room for regulatory review of the modifications and regulatory impact upon the design and design activities. Ironically, the flexible regulatory framework may have contributed to this situation; DOE postponed inspections for about a year that could have identified this situation and that could have potentially endorsed a CAP for correcting the situation. pp</p>	<p>(2) Maintenance of design/authorization basis Design/Authorization Bases, Concept Evolution, Design Changes and Integration In the eight years since NUREG 1747 (NRC, 2001) was written, the control of the authorization basis has evolved. The Contractor is required to perform safety evaluations for all changes affecting safety. Changes that are significant have to be submitted to DOE for review and approval prior to implementation. The Contractor has developed implementing procedures that institutionalize the safety evaluation process. For those changes submitted to DOE for review, DOE issues a SER assessing the change for safety and conformance with requirements. In addition, DOE performs a periodic review of the PSAR to ensure that all safety evaluations are properly reflected in it. This ensures that the PSAR accurately describes plant design.</p>
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	<p>xxii,xxiii</p> <p>(3) The application of a risk-based approach to the development of the design without additional considerations.</p> <p>Risk-based analyses were used as the basis for the ISM process, which includes hazards identification, consequence estimation, and control mitigation. This is essentially a completely fluid process without a minimum level of requirements and, as practiced on TWRS-P, did not appear to adequately address unknowns, uncertainties, errors, proven practices, future plans, and experience... There appeared to be more emphasis on the process, and less on the results.... ISM focused on the higher risk areas by challenging assumptions; assumptions that were changed and resulted in lower consequences and risks may not have been revisited or re-evaluated as thoroughly. Thus, reduced consequence estimates may have resulted, and control strategies and equipment may not have been adequately identified. In contrast, the NRC regulatory approach applies a risk-informed, performance-based approach with defense-in-depth, appropriate levels of conservatism.</p> <p>(4) Limited use of NRC regulations and guidance: DOE has adopted the NRC principles of good regulation in the</p>	<p>(3) The application of a risk-based approach to the development of the design without additional considerations.</p> <p>Risk Based Design Approach The design approach for the facility is not primarily “risk based.” The design approach, as discussed in Issue # 2 above, starts with a non probabilistic assessment of the worst consequences that could occur at the facility, then requires development of safety controls to ensure the expected consequences with controls are low. ...In addition, the Contract (DOE, 2000) has required one method of verification of the adequacy of the design to be an assessment of the total risk of the facility, using the risk objectives assigned by the Secretary of Energy in Secretarial Energy Notice, SEN 35-91 (DOE, 1991). This verification is a secondary objective. Rigorous estimation of risk using a probabilistic risk assessment is subject to many uncertainties for a one of a kind facility. This is one of the reasons DOE does not rely on this technique for its primary method of assuring adequate safety from nuclear, radiological and process safety hazards to the public and workers at the WTP, as pointed out in the NUREG 1747 (NRC, 2001) statement of this issue.</p> <p>4) Limited use of NRC regulations and guidance</p> <p>No Comment</p>
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	<p>documents that form the basis for the TWRS-P regulatory approach. However, DOE has not adopted the use of NRC regulations and guidance for TWRS-P, such as 10 CFR Part 70 and the TWRS Standard Review Plan. Instead, standards, codes, and regulations were selected by the Contractor and approved for their use by the RU with the application of ISM</p>	
<p>COLLOCATED WORKER AS MEMBER OF THE PUBLIC</p> <p>DOE's regulation uses a co-located worker approach for radiation protection and chemical safety. This use has the potential to produce differing classifications for systems, structures, and components required for risk reduction to workers and the public... DOE's use of the co-located worker concept, compared with a member of the public, and application of the risk goals to normal operations, is also different from NRC's implementation of risk assessment practice... DOE uses the concept of "co-located" as a worker on the DOE site who is not working in the facility being evaluated. A co-located worker is an individual within the Hanford site, beyond the WTP controlled area, performing work for or in conjunction with DOE or utilizing other Hanford site facilities. DOE's classification of some workers conducting other DOE activities on the Hanford site as co-located workers results from the numerous, diverse, and often unrelated facilities and activities involving radioactive materials located at a common site. While the co-located worker is subject to most all of the radiological worker dose standards, the co-located worker is not subject to additional requirements for radiological workers such as training, monitoring, and records. NRC would usually consider</p>	<p>COLLOCATED WORKER AS MEMBER OF THE PUBLIC</p> <p>In summary, the DOE is using the concept of CLW for the proposed TWRS/WTP facilities; essentially the CLW is allowed the same dose and risk limits as the workers and all members of the public, visitors, etc., to the site are considered .general employees. and are allowed to accumulate occupational exposure. For TWRS-P, DOE plans to use a large portion of the Hanford site for this purpose, which typically results in minimum distances to members of the public (i.e., with lower dose and risk limits) of approximately 10 miles. In contrast, the NRC focuses on the concept of .controlled area. by the facility operator; at NRC facilities, this is usually associated with a fence although the controlled area can extend beyond the fence and even beyond the site boundary. Thus, the NRC approach usually corresponds to a shorter distance (usually 100-200 meters) to the public for accident analysis purposes, which can translate into more items relied on for safety (IROFS). P. 142... The co-located worker concept would be a difficult issue to resolve if regulatory control of the TWRS-P contractor were to shift from</p>	<p>COLLOCATED WORKER AS MEMBER OF THE PUBLIC</p> <p>NO COMMENT</p>

<p>the workers located on the site, but not working in a specific facility, as members of the public, for accident-scenario evaluation.... DOE's practice of using the concept of a co-located worker is a significant difference from NRC's approach and may produce differing classifications for systems, structures, and components required for risk reduction to workers and the public</p>	<p>DOE to NRC. It would require either an exception to the NRC regulations or a change in (a reduction of) the exposure permitted to persons beyond the controlled area boundary (per 10 CFR Part 835) or restricted area boundary (per 10 CFR 20). [To accomplish a reduction in exposure after construction of the facility had been completed, it would be necessary to require the contractor to invoke one or more of the following remedies: retrofit with additional shielding, dilute the radioactive waste feed streams to lower the activity (and thereby increase the total volume of vitrified waste), moving co-located workers farther away from the contractor's facility, and possibly other methods.] Discussion of this issue between the two organizations produced no concession or compromise. When DOE concluded that there was little or no likelihood that such a transition would occur, the issue was left unresolved from the NRC point of view.</p>	
<p>DISTANCE TO THE SITE BOUNDARY</p> <p>For Operations Risk, the goal is stated quantitatively as 2×10^{-6} per year latent cancer fatality risk. This is for a hypothetical location of a person at the Hanford Site boundary. It also states that risks from normal operations shall be included with those from accidents. P 78</p>	<p>DISTANCE TO THE SITE BOUNDARY</p> <p>Although the concept of .site boundary. may appear to be self-evident, it is not defined in 10 CFR Part 835. A definition is provided by Part 20: Site boundary means that line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee. A consequence of the lack of a definition in 10 CFR Part 835, at least from the NRC point of view, is that DOE and/or its contractor can specify a .fence-line. for the calculation of dose to the public that is well beyond the boundary that is under direct</p>	<p>DISTANCE TO THE SITE BOUNDARY</p> <p>DOE agrees that the potential effects of reducing the site boundary to a position closer to the facility boundary have not been considered in the design of the facility. If DOE were directed to make such a reduction to meet other important national priorities, it is possible that refinement of the safety analysis would still permit such a reduction, given the large safety margins that exist in the current assumed source term for the facility. However, at this point, such reductions are not planned, so no</p>

	<p>oversight of the contractor. The area between the contractor's oversight and the boundary of the DOE-defined controlled area is the realm of the co-located workers. It should also be noted that most persons who are granted access within the Hanford site boundary will be considered occupationally exposed personnel by DOE, whereas under NRC regulations, many such persons would be considered members of the public.</p>	<p>detailed analysis of the impacts of such a reduction has been performed.</p>
<p>NUCLEAR CRITICALITY SAFETY NRC's review of DOE's authorization practices found there is less information in the DOE safety analysis on nuclear-criticality-safety technical practices than NRC would typically accept. NRC determined that the contractor's nuclear-criticality-safety staff involvement in the review of new or changed designs is not formalized in procedures, which could lead to a deficient safety basis for the facility, if it was not otherwise detected and corrected. For the WTP, DOE's nuclear criticality safety approach centers on the determination that a criticality accident is not credible. If the contractor's approach to nuclear criticality safety changes and criticality accidents are reconsidered credible, nuclear-criticality-safety controls would need to be established. This would be a major change for the DOE WTP nuclear-criticality-safety program.</p>	<p>NUCLEAR CRITICALITY SAFETY Based on the criticality safety program document and criticality safety analyses provided, more information would be required to determine the overall conformance with NRC regulations. With the exception of the issues addressed above involving meeting the double contingency principle and the issue of dual coverage with respect to criticality alarms (this would require either an exemption or facility changes should the NRC ever assume regulatory authority), it is not possible to determine the state of conformance with NRC regulations for the proposed new vitrification facility. Much more detail about the design of the facility and processes would be required by the NRC to make this assessment.... In each of the evaluations, BNFL Inc. has relied upon concentration limits for special nuclear material as provided for in their contract with DOE as an upper boundary for criticality analyses, despite the fact that there are waste forms within the Hanford tank waste that may be above those limits. The criticality values</p>	<p>NUCLEAR CRITICALITY SAFETY The WTP criticality design and safety analyses have been modified and extensively revised since NUREG 1747 (NRC, 2001) was issued. DOE will ensure that the final approved design meets Part 830 and DOE O 420.1 (DOE, 2002a), as required. Based on the current criticality analysis referenced in the PSAR, DOE expects that existing open review issues should be resolved without requiring significant rework of the facility design or safety controls by the Contractor, by improving the current criticality analyses. Final confirmation of the design and safety management systems will occur with the review and approval of the Documented Safety Analysis, which is required to be submitted one year before the start of cold testing.</p>

	<p>are from the Carter Handbook that is widely used in the DOE Complex. However, these have not undergone rigorous validation. The NRC uses American National Standards Institute/American Nuclear Society (ANSI/ANS) 8.1 and other ANS standards that have undergone rigorous validation (see NRC Regulatory Guide 3.71). A review using the SRP would expect BNFL Inc. to indicate their control methods for ensuring that materials of higher concentration will not enter the facility and that accumulation will not occur due to the processing.</p>	
<p>FIRE PROTECTION</p> <p>The major differences in fire protection are in the design-build process, the focus on the level of protection based on financial loss, and in lower staffing levels. DOE ORP procedures and manuals address some areas in a general narrative manner, rather than with specific requirements and procedural directions. These procedures and manuals are not comparable to NRC's guidance for assessments. P 80</p>	<p>FIRE PROTECTION</p> <p>Specific Examples</p> <ol style="list-style-type: none"> 1. Process building construction classification: BNFL Inc. proposed a construction type which would not meet the requirements for Type 1 construction per National Fire Protection Association (NFPA) 220, nor the fire resistive construction types required by a strict interpretation of the Uniform Building Code (UBC). 2. Steel fireproofing: The steel fireproofing issue is related to the construction classification issue. If fire resistance of the outside walls is not required, fireproofing of structural steel for these walls would not be required. In addition, BNFL Inc. wished to avoid fireproofing of structural steel in areas of low combustible loading. 3. Protection of final high efficiency particulate air (HEPA) filters from fires: BNFL Inc. has stated in the fire protection Level 1 Meeting that no water sprays would be employed in filter plenums based on the 	<p>FIRE PROTECTION</p> <p>Since the issuance of NUREG 1747 (NRC, 2001) in 2001, the fire protection hazard analysis and design has advanced considerably. The current analysis is provided in six volumes that address: (1) general information; (2) balance of facilities; (3) analytical laboratory; (4) LAW building; (5) pretreatment building; and (6) HLW building. DOE approved this analysis in the SER for the 2006 PSAR. Final confirmation of the design and safety management systems related to fire protection will occur with the review and approval of the Documented Safety Analysis, which is required to be submitted one year before the start of cold testing.</p>

	<p>superior qualifications of the circular filters to be used.</p> <p>4. BNFL Inc. has proposed modified requirements for the use of sprinklers in radioactive areas of the facility:</p> <p>a. C5 Areas (most contaminated with low fire loading): No sprinklers or steel fireproofing in C5 areas.</p> <p>b. C3 Areas (moderate contamination with varying degrees of combustible loading and safety significance): Sprinklers used selectively in these areas with justification provided where sprinklers are not used.</p> <p>c. C2 Areas (low potential for contamination, with in-situ and transient combustibles</p>	
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