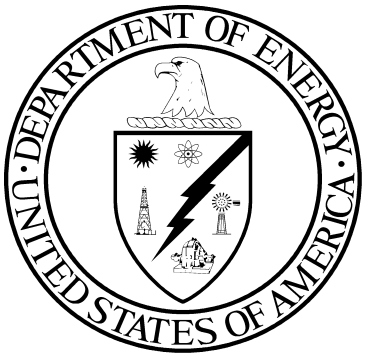
RL/REG-98-23
Revision 0

Bases for the Top-Level Standards and Principles and Glossary Definitions



October 1998

Office of Radiological, Nuclear and Process Safety Regulation of TWRS Privatization Contractors

Richland Operations Office
PO Box 550
Richland, WA 99352

Approved: _____

Date: _____

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PREFACE

The Department of Energy's (DOE) Richland Operations Office (RL) issued a request for proposal in February 1996 for privatized processing of waste as part of the Hanford Tank Waste Remediation System (TWRS). Offerors were requested to submit proposals for the initial processing of the tank waste at the Hanford Site. Some of this radioactive waste has been stored in large underground storage tanks at the Site since 1944. Currently, approximately 54 million gallons of waste containing approximately 250,000 metric tons of processed chemicals and 215 million curies of radionuclides are being stored in 177 tanks. These caustic wastes are in the form of liquids, slurries, saltcakes, and sludges. The wastes stored in the tanks are defined as high-level radioactive waste (10 CFR Part 50, Appendix F) and hazardous waste (Resource Conservation and Recovery Act).

Under the privatization concept, DOE intends to purchase waste processing services from a contractor-owned, contractor-operated facility through a fixed-price contract. DOE will provide the waste feedstock to be processed but maintain ownership of the waste. The contractor must: a) provide private financing; b) design the equipment and facility; c) apply for and receive required permits and licenses; d) construct the facility and commission its operation; e) operate the facility to process tank waste according to DOE specifications; and f) deactivate the facility.

The TWRS Privatization Program is divided into two phases, Phase I and Phase II. Phase I is a proof-of-concept/commercial demonstration-scale effort the objectives of which are to a) demonstrate the technical and business viability of using privatized contractors to process Hanford tank waste; b) define and maintain adequate levels of radiological, nuclear, process, and occupational safety; c) maintain environmental protection and compliance; and d) substantially reduce life-cycle costs and time required to process the tank waste. The Phase I effort consists of three parts: Part A, Part B-1, and Part B-2.

Part A is a twenty-month period to establish technical, operational, regulatory, and financial elements necessary for privatized waste processing services at fixed-unit prices. This includes identification by the TWRS Privatization Contractors and approval by DOE of appropriate safety standards, formulation by the Contractors and approval by DOE of integrated safety management plans, and preparation by the Contractors and evaluation by DOE of initial safety assessments. Of the twenty-month period, sixteen months is for the Contractors to develop the Part-A deliverables and four months is for DOE to evaluate the deliverables and determine whether to authorize Contractors to perform Part B. Part A culminated in DOE's authorization on August 24, 1998, of BNFL Inc. to perform Part B.

Part B-1 is a twenty-four month period to a) further the waste processing system design introduced in Part A, b) revise the technical, operational, regulatory, and financial elements established in Part A, c) provide firm fixed-unit prices for the waste processing services, and d) achieve financial closure.

Part B-2 is a sixteen year period to complete design, construction, and permitting of the privatized facilities; provide waste processing services for representative tank wastes at firm fixed-unit prices; and deactivate the facilities. During Part B-2, approximately 10% of the total Hanford tank wastes will be processed.

Phase II will be a full-scale production effort. The objectives of Phase II are to implement the lessons learned from Phase I and to process all remaining tank waste into forms suitable for final disposal.
A key element of the TWRS Privatization Program is DOE's regulation of radiological, nuclear, and process safety through the establishment of a specifically defined regulatory approach and a specifically chartered, dedicated Regulatory Unit (RU) at RL. This regulation is authorized by DOE through the document entitled *Policy for Radiological, Nuclear, and Process Safety Regulation of TWRS Privatization Contractors* (referred to as the Policy) and is implemented through the document entitled *Memorandum of Agreement for the Execution of Radiological, Nuclear, and Process Safety Regulation of the TWRS Privatization Contractors* (referred to as the MOA). The Policy is signed by the Under Secretary of Energy; the Manager, RL; the Assistant Secretary for Environment, Safety and Health (ASEH); and the Assistant Secretary for Environmental Management (ASEM). The MOA is signed by the Manager, RL; the ASEH; and the ASEM. The MOA details certain interactions among RL, the ASEH, and the ASEM as well as their respective roles and responsibilities for implementation of the regulatory approach.

The authority of the RU to regulate the TWRS Privatization Contractor is derived solely from the terms of the TWRS Privatization Contract. Its authority to regulate the Contractor on behalf of DOE is derived from the Policy. The characteristics and scope of this special regulatory approach (special in the sense that it is based on terms of a contract rather than formally promulgated regulations) are delineated in the MOA, the TWRS Privatization Contract, and the following four documents, which are incorporated into the Contract and are part of the MOA.

> *Concept of the DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors*, DOE/RL-96-0005
>
> *DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors*, DOE/RL-96-0003
>
> *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors*, DOE/RL-96-0006
>
> *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for TWRS Privatization*, DOE/RL-96-0004

Regulation by the RU in no way replaces any legally established external regulatory authority to regulate in accordance with their duly promulgated regulations nor relieves the Contractor from any obligations to comply with such regulations or to be subject to the enforcement practices contained therein.

In the execution of the regulatory approach through its regulatory program, DOE expects the RU to consider not only the relevant approaches and practices of DOE but also those of the Nuclear Regulatory Commission (NRC). The Policy states that

> "It is DOE's policy that TWRS privatized contractor activities be regulated in a manner that assures adequate radiological, nuclear, and process safety by application of regulatory concepts and principles consistent with those of the Nuclear Regulatory Commission."

To this end, the RU interacts with the NRC (under the provisions of a memorandum of understanding with the NRC) during development of regulatory guidance and during execution of the regulatory program to ensure implementation of this policy.

All documents issued by the Office of Radiological, Nuclear, and Process Safety Regulation of TWRS-P Contractors are available to the public through the DOE/RL Public Reading Room at the Washington State University, Tri-Cities Campus, 100 Sprout Road, Richland, Washington.

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REGULATORY UNIT REVIEW OF THE BASES FOR THE TOP-LEVEL STANDARDS AND GLOSSARY DEFINITIONS

1.0 PURPOSE

The document "Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors," DOE/RL-96-0006, contains top-level standards and principles that describe ways to achieve the expected level of safety for TWRS privatization. The Contractor is required to address and incorporate the top-level standards and principles in the Contractor's set of standards. DOE/RL-96-0006 also includes a glossary of terms. The glossary provides a definition of the key words and phrases used in one or more of the documents that describe the elements of the TWRS privatization regulatory process.[1]

This review paper establishes the source of each top-level standards and principles and provides an explanation of any change to the source material that was incorporated in DOE/RL-96-0006, Revision 1, to specifically address TWRS privatization. This paper also establishes the source of each definition of DOE/RL-96-0006, Revision 1. Even though some of these words or phrases are not used in DOE/RL-96-0006 but rather in one or more of the other documents that describe the elements of the TWRS privatization regulatory process, all of the glossary definitions are addressed here so that their genesis is addressed in one document.

2.0 DISCUSSION

Previous Department of Energy (DOE) procurement practices relied on stipulating standards or general design criteria (i.e., General Design Criteria, DOE Order 6430.1A) as requirements to potential bidders as part of a request for proposal (RFP) or Architect/Engineer selection process. These practices were viewed as overly restrictive; in some cases, they resulted in costly features in the design and operations, provided a limited safety benefit, and competed with more effective measures for safety resources. The DOE's Necessary and Sufficient Process was under development when the TWRS privatization RFP was being prepared and was considered a principal vehicle for standards identification that could provide relief.

DOE/RL-96-0006 went through many revisions as the TWRS Privatization procurement strategy

1 *DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors,* DOE/RL-96-0003, Revision 1, July 1998; *Process for Establishing a Set of Radiological, Nuclear, and Process Safety Standards and Requirements for TWRS Privatization,* DOE/RL-96-0004, Revision 1, July 1998; *Concept of the DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors,* DOE/RL-96-0005, Revision 1, July 1998; *Top-Level Radiological, Nuclear, and Process Safety Standards and Principles for TWRS Privatization Contractors,* DOE/RL-96-0006, Revision 1, July 1998.

developed. The original concept for this document was to limit its content to top-level radiological and nuclear standards (dose limits). In conjunction with this concept, the Necessary and Sufficient Process for identification of standards was to be used either by the contractor or a DOE safety oversight organization to establish a set of standards that would control the hazards related to the work. This concept was challenged on the grounds that it provided too much latitude to the contractor and did not incorporate lessons learned regarding nuclear facility design and operation. Basically, no design measures were prescribed that ensured good nuclear practices.

Because the imposition of undue design constraints was not desirable, it was not practical to identify general design criteria (or general safety requirements) without a baseline design. The original concept of the regulatory approach was broadened to include a set of safety principles for design and operation. This brought in lessons learned and accepted practices that have been developed by the nuclear power industry over the past 50 years. As part of the safety principles, safety goals were also included. As a result, initial drafts of DOE/RL-96-0006 augmented acceptable radiological exposure and potential nuclear accident consequences with safety principles based on accepted nuclear practices.

Subsequently, the DOE requested that measures be taken to address worker protection more explicitly. This was addressed in two ways. The dose standards were revised to require the development of worker limits for accident conditions. In conjunction with this, the safety goals were expanded to include safety goals for workers. These measures were modeled after approaches taken for public protection but were stipulated in a manner that allowed the contractors to develop specific approaches. These expansions dealt with worker radiological and nuclear criticality safety.

Finally, the DOE[2] requested that Occupational Safety and Health Administration (OSHA) concepts be addressed in a manner that would afford more proactive measures for process safety. This addition would provide protection of the public and workers not only from radiological and nuclear hazards, but also from a wider range of hazards, including chemical. A separate set of principles was derived for process safety from OSHA regulations (29 CFR 1910.119).

The development process for DOE/RL-96-0006 was carried out in several steps. The radiological and nuclear (dose) standards were derived from a review of Nuclear Regulatory Commission (NRC) regulations for non-reactor nuclear facilities, seven sets of DOE guidelines either in use or proposed for use throughout the DOE complex, and the current U.S. Department of Energy Radiological Control Manual. A set of design-independent radiological and nuclear safety principles for design and operation was developed based on the General Safety Principles contained in two requirements documents developed from the DOE's New Production Reactor

2 *Occupational Safety and Health Administration Regulation for Privatized Facilities*, Letter from Tara O'Toole, March 21, 1996.

(NPR) Program, one for the High Temperature Gas-Cooled Reactor[3] and the other for the related nonreactor nuclear facilities[4], including the Tritium Recovery Facility. Both requirements documents were the result of an extensive development effort over a period of many months. Prepared by multi-organizational teams called the General Safety Requirements Documents (GSRD) Working Group and the Nonreactor Nuclear Facilities Working Group, the requirements documents were reviewed rigorously by Los Alamos National Laboratory and the DOE and were approved by the Director of the DOE Office of New Production Reactors.

The General Safety Principles in those documents are intended to be independent of particular reactor concepts and are statements of safety sufficiency based on safety policies, safety goals, safety principles, and safety objectives. The General Safety Principles expand the NPR Safety Policy (NPD-002) and were derived from many sources, including DOE Orders; the NRC Advanced Reactor Safety Policy, Severe Accident Policy, and Safety Goal Policy; and the International Atomic Energy Agency's "Basic Safety Principles for Nuclear Power Plants" (International Nuclear Safety Advisory Group 75-INSAG-3). The General Safety Principles were not considered requirements for determining design compliance, but provided the basis for the General Safety Requirements (general design criteria). Similarly, quantitative safety goals were included to provide numerical design objectives for use of risk-related information in the design process. However, these were not requirements for determining design compliance. Rather, they delineate provisions for the prevention and mitigation of risk-dominant events.

Although the General Safety Principles reflect accepted radiological and nuclear safety design and operational practices, they needed to be modified for the purposes of DOE/RL-96-0006. First, the Principles were screened and modified for technological incompatibilities. Second, a functional hazards analysis[5] that was developed for a baseline immobilization facility design, one for which there was no conceptual design information, was used to identify the hazards to the public and workers. These hazards were screened and the safety principles modified to reflect the TWRS privatization hazards. This screening simplified the criticality principle, replaced the containment principle with a confinement principle, and removed the severe-accident goal. These changes resulted in a set of radiological and nuclear principles that were tailored to TWRS privatization. Special care was taken to minimize the introduction of new principles or concepts.

The process safety principles were introduced as a separate set to maintain separation and clarity of concepts. There was no source similar to the NPR for these principles. In this case, the elements of 29 CFR 1910.119 were used as the basis. The primary enhancement embedded in these principles is the requirement that certain information be submitted to the Regulatory Unit

3 *General Safety Requirements Document for the New Production Modular High Temperature Gas-Cooled Reactor*, DOE/NP HWR-GSR-0001, Revision 1, and LA-NPR-4, Revision 3, January 30, 1991.

4 *Facility General Safety Requirements for the New Production Reactor Nonreactor Nuclear Facilities*, DOE/NP NNF-GSR-0001, Revision 0, and LA-NPR-35, April 1995.

5 *Preliminary Hazard Analysis for the Tank Waste Remediation System (TWRS) Privatization Phase I Conceptual Facilities*, LA-CP-95-286, December 1995.

for evaluation in support of authorization decisions and regulatory oversight. In addition, three overall principles were developed, including process safety management, objectives, and responsibility. These principles provided compatibility with radiological and nuclear safety.

The final document was reviewed by the DOE TWRS Privatization RFP Contractor Support Team; DOE/Environment, Safety and Health; and DOE/Environmental Management before it was included, along with the other three radiological, nuclear, and process safety regulatory program description documents, into Standard 4 and Appendix J of the RFP. DOE/RL-96-0006 was fundamental to the acceptance of the TWRS privatization standards identification process and regulatory approach as defined in the Policy[6] and included in the Memorandum of Agreement (MOA).[7]

The glossary included in DOE/RL-96-0006 is common to three of the four regulatory program description documents included in the RFP. The glossary was not included with the Concept[8] document. As with the safety principles, the glossary has its origins in the NPR requirements documents. The NPR requirements document glossary was screened for applicable terminology. Only then were the definitions changed based on the availability of more refined terminology. Where conflicts occurred, the 10 CFR 800 series of rules took the highest priority, followed by the newly revised DOE orders. In some limited cases, there was no dominant terminology, and definitions were developed to document the intended meaning expressed in the TWRS Privatization regulatory documents included in Standard 4 and Appendix J of the RFP.

3.0 REVIEW

Top-Level Standards and Principles

The top-level standards and principles are contained in Sections 2.0 through 5.0 of DOE/RL-96-0006. Section 2.0 contains "Radiological and Nuclear Safety Standards." Sections 3.0 and 4.0 contain "Radiological and Nuclear Safety Objectives" and "General Radiological and Nuclear Safety Principles," respectively. Section 5.0 contains "General Process Safety Principles."

The majority of the standards and principles arose from two sources: 1) the "INSAG-3" report,[9] which is a report by the International Atomic Energy Agency that provides basic safety principles

6 *Policy for Radiological, Nuclear, and Process Safety Regulation of TWRS Privatization Contractors*, DOE/RL-96-25, Revision 0, July 3, 1996.

7 *Memorandum of Agreement for the Execution of Radiological, Nuclear, and Process Safety Regulation of TWRS Privatization Contractors*, DOE/RL-96-26, Revision 0, July 3, 1996.

8 *Concept of the DOE Regulatory Process for Radiological, Nuclear, and Process Safety for TWRS Privatization Contractors*, DOE/RL-96-0005, Revision 0, February 1996.

9 *Basic Safety Principles for Nuclear Power Plants*, a report by the International Nuclear Safety Advisory Group, Safety Series No. 75-INSAG-3, International Atomic Energy Agency, Vienna, 1988.

for nuclear power plants, and 2) the "NPR" document,[10] which, as discussed in Section 2.0 of this document, provides general safety principles and requirements for the New Production Reactor "heavy water reactor" concept. In many cases the general safety principles in the NPR document arose from the principles in the INSAG-3 report. Section 2.0 of this document discussed the incorporation of these principles into DOE/RL-96-0006.

Some changes to the INSAG-3 and NPR principles that were made consistently throughout DOE/RL-96-0006 require explanation. One example is the use of the word "should" rather than "will." Although this could suggest that the top-level standards and principles are recommendations rather than requirements, this is not the case. As discussed in the introduction to DOE/RL-96-0006 (Section 1.1), the Contractor "must address these top-level standards and principles in the standards and requirements identified by the Contractor" and "shall incorporate the top-level...standards and principles into the recommended standards and requirements." Therefore, the use of the term "should" in DOE/RL-96-0006 versus "will" in the source documents should be considered a cosmetic change only; the associated standards and principles are not optional.

Another change to the principles contained in the source documents was the elimination of the focus on nuclear reactors. For example, the term "plant" was consistently changed to "facility." Additionally, in some instances the scope and breadth of the standards and principles was deliberately reduced consistent with the fact that the vitrification facility is not a nuclear reactor and thus the hazards inherent in its operation are somewhat less. Nevertheless, the set of standards and principles contained in DOE/RL-96-0006 is quite robust and reflects the rigor expected in assuring safe operation of the facility.

In some cases both the INSAG-3 and NPR documents contained a principle or standard that was similar to that in DOE/RL-96-0006. In these cases, INSAG-3 was selected as the source document because the NPR principle or standard most likely originated in INSAG-3. However, in cases in which the NPR principle or standard contained a substantially revised version of the corresponding INSAG-3 principle or standard and the DOE/RL-96-0006 statement more closely matched the NPR statement, the NPR document was selected as the source.

Appendix A of this document contains the RU assessment of the basis for each top-level standard. For each standard, the following is provided:

10 *HWR - General Safety Requirements*, HWR-GSR-0001, Rev. 0, January 30, 1991, U.S. Department of Energy, Washington, DC.

- the verbatim requirement from DOE/RL-96-0006, Rev 1;
- the verbatim requirement from the basis document (usually either NPR or INSG-3), with revision markings[11] to illustrate a match with the DOE/RL-96-0006 standard; and
- a discussion of the differences between the DOE/RL-96-0006 standard and the statement in the basis document, and the justification for any significant (non-editorial) differences.

The principles and standards are addressed individually in Appendix A contained in Sections 3.0 and 4.0 for DOE/RL-96-0006. For the standards in Section 2.0 (Table 1), a reference to a previous RU document addressing this issue is provided, and for Section 5.0 the standards and principles are addressed collectively because they arose from a single source (29 CFR 1910.119).

Glossary Definitions

There are 74 words or phrases in the Glossary in DOE/RL-96-0006 (and two of the other Regulatory Unit governing documents). Some of these were developed specifically for TWRS privatization. The majority, however, are used commonly in the nuclear industry. The original sources of these terms include:

- DOE regulations (e.g., 10 CFR 835);
- DOE Orders (e.g., DOE 5480.23);
- the DOE Glossary;
- the DOE Radiological Control Manual;
- NRC regulations (e.g., 10 CFR 20);
- OSHA regulations (e.g., 29 CFR 1910);
- the NPR document; and
- various guidance documents.

In many cases, the definitions have been deliberately altered from those found in the source documents. This occurred in part to avoid inadvertent adoption of numerous multi-tiered DOE standards and/or NRC regulations that are not adopted in the TWRS-P Contract. For example, use of the term "safety class" is avoided because it might suggest that the Regulatory Unit intends that the term be used as defined in the context of DOE-STD-3009-94.[12] In this particular standard (not part of the TWRS-P Contract), safety-class is defined in relation to the other formal DOE terms of "safety functions," "system description," "functional requirements," "system evaluation," etc. Upon further examination, one finds that these second tier terms are defined in

11 These consist of underline markings to reflect added text and strike-through markings to reflect deleted text.

12 *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, DOE-STD-3009-94, July 1994, U.S. Department of Energy, Washington, DC.

other DOE Orders, which in turn depend on other DOE directives, and so on. This is only one example of many.

Importantly, the precise definitions provided in the Regulatory Unit governing document glossary are extensively and carefully interwoven into the Contractual Documents. The integrated product is self-consistent and has survived the scrutiny of numerous external reviews without alteration in over two years of use.

Ultimately, alteration of the terms used in the Regulatory Unit governing documents in order to facilitate the transition of TWRS-P regulation to the NRC may be necessary. However, any such modification of terminology must be performed carefully, with deliberate and in-depth review of the impact of terminology changes on the fundamental contractual underpinnings of the safety program.

Appendix B contains the RU position on the basis for each of the glossary definitions. For each definition, the following is provided:

- the verbatim definition from the DOE/RL-96-0006 glossary;
- the verbatim requirement from the basis document with revision markings to illustrate a match with the glossary definition; and
- a discussion of the differences between the DOE/RL-96-0006 definition the corresponding definition in the basis document, and the justification for any significant (non-editorial) differences.

APPENDIX A: SOURCES OF TOP-LEVEL STANDARDS

Source References Identified in this Appendix

29 CFR 1910. "Occupational Safety and Health Standards," Occupational Safety and Health Administration, U.S. Department of Labor, Washington, DC, 1992.

EH-12-94-01. "Method for the Assessment of Worker Safety under Radiological Accident Conditions at Department of Energy Nuclear Facilities," U.S. Department of Energy, Washington, DC, 1994.

INSAG-3. "Basic Safety Principles for Nuclear Power Plants," International Nuclear Safety Advisory Group, International Atomic Energy Agency, Vienna, 1988.

NPR. "General Safety Requirements Document for the New Production Modular High Temperature Gas-Cooled Reactor," DOE/NP HWR-GSR-0001, Rev. 1, U.S. Department of Energy, Washington, DC, 1991.

2.0 Radiological and Nuclear Safety Standards

The radiological and nuclear standards in this section are the human dose standards to which all facility activities of the Contractor involving radiological and nuclear hazards must comply. These standards are consistent with radiological exposure limits embodied in DOE and NRC regulations and the perspectives of the International Council on Radiological Protection. The standards presented herein do not include standards for various release pathways and are not necessarily a complete set for human doses. The absence of other standards is not intended to exempt the Contractor from the obligation to comply with all applicable requirements pertaining to limiting exposures to workers and the public.

2.1 Individual

The top-level radiological and nuclear safety standards for workers, co-located workers, and the public for various situations are listed in Table 1. Footnotes to the table refer to the origin of a specific standard. Additional information on terminology, definitions, and methods can be found in those references. As noted in the references, some of the standards can not be applied independent of other dose contributors located on the Hanford Site.

Basis: **The bases for these standards are discussed in the RESW Evaluation Report, Appendix B.**

Summary of Changes in the Development of 0006: The development of the standards and the RU position are discussed in Appendix B to RL/REG-98-01, "DOE Regulatory Unit Evaluation Report of the BNFL Inc. Safety Requirements Document."

3.0 Radiological and Nuclear Safety Objectives

The safety objectives included in this section are radiological and nuclear safety goals, which if accomplished, should ensure protection of public and worker health and safety. The Contractor should use these objectives to determine 1) the effectiveness in achieving the expected level of safety and 2) the need for additional measures.

3.1 General Safety Objectives

3.1.1 Operations Risk Goal

The risk, to the population (public and workers) in the area of the Contractor's facility, of cancer fatalities that might result from facility operation should not exceed one-tenth of one percent (0.1%) of the sum of cancer fatality risks to which members of the U.S. population generally are exposed.[13]

Basis: **NPR**

The risk to the population (public and workers) in the area of the Contractor's facility, ~~near the NPR~~ of cancer fatalities that might result from facility ~~NPR~~ operation should not exceed one-tenth

13 For evaluation purposes, individuals are assumed to be located within 10 miles of the controlled area.

of one percent (0.1%) of the sum of cancer fatality risks to which members of the U.S. population generally are exposed. For evaluation purposes, individuals are assumed to be located within ~~The area near the NPR is defined to be the zone surrounding the facility extending~~ ten miles off ~~from~~ the controlled area ~~an inner boundary formed by the reactor facility control perimeter (security fence).14~~

Summary of Changes in the Development of 0006: Clarification was provided that individuals included in the assessment are located within 10 miles of the controlled area. The numerical risk guideline of 2 X 10^{-6} per year associated with the risk goal that is shown in the footnote was not included. The RU believes that this was an inadvertent omission; an identical numerical risk guideline is derived in Appendix B to RL/REG-98-01, "DOE Regulatory Unit Evaluation Report of the BNFL Inc. Safety Requirements Document."

3.1.2 Accident Risk Goal

The risk, to an average individual in the vicinity of the Contractor's facility, of prompt fatalities that might result from an accident should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatality risks resulting from other accidents to which members of the U.S. population generally are exposed.[15]

Basis: **NPR**

The risk, to an average individual in the vicinity of the Contractor's facility ~~NPR~~, of prompt fatalities that might result from an ~~reactor~~ accidents ~~should not exceed one-tenth of one percent (0.1%) of the sum of prompt fatality risks resulting from other accidents to which members of the U.S. population generally are exposed. For evaluation purposes, individuals are assumed to located within ~~The vicinity of the NPR is defined to be the zone surrounding the facility extending~~ one mile ~~from an inner boundary formed by the reactor facility~~ of the controlled area ~~perimeter (security fence)~~. ~~The average individual refers to the average individual biologically (in terms of age and other risk factors) and locationally who is to be found within the zone noted above, and is found by accumulating the estimated risk to all the individuals and dividing by the number of individuals expected in the zone, including transient population and workers, with realistic consideration of emergency response.16~~

Summary of Changes in the Development of 0006: Clarification was provided that individuals included in the assessment are located within 1 mile of the controlled area. The numerical risk guideline of 5 X 10^{-7} per year associated with the risk goal that is shown in the footnote was not included. The RU believes that this

~~14 The following numerical guideline should be used in conjunction with this goal. The risk of cancer fatalities (long-term fatalities or latent cancers) to the population (public and workers) in the area near the NPR should be less than 2 x 10^{-6}/average individual/yr (1 chance in 500,000 per year).~~

15 For evaluation purposes, individuals are assumed to be located within one mile of the controlled area.

~~16 The following numerical guideline should be used in conjunction with this goal. The risk of a prompt fatality to an average individual in the vicinity of the NPR should be less than 5 x 10-7/yr (1 chance in 2,000,000 per year).~~

was an inadvertent omission. Nevertheless, as discussed in Appendix B to RL/REG-98-01, "DOE Regulatory Unit Evaluation Report of the BNFL Inc. Safety Requirements Document," the RU position is that a definitive numerical risk guideline is not needed because conformance to the risk goal is assured by the dose standards for credible accidents.

3.1.3 Worker Accident Risk Goal

The risk, to workers in the vicinity of the Contractor's facility, of fatality from radiological exposure that might result from an accident should not be a significant contributor to the overall occupational risk of fatality to workers.[17]

Basis: **EH-12-94-01**

The risk, to workers in the vicinity of the Contractor's facility, of fatality from radiological exposure that might result from an accidents ~~to a worker at a Department of Energy site~~ should ~~be controlled so as~~ not be a significant contributor to the overall occupational risk of fatality to ~~the~~ workers. ~~Furthermore, the risk should be minimized to be as low as reasonably achievable (ALARA)~~For evaluation purposes, individuals are assumed to be located within one mile of the controlled area.

Summary of Changes in the Development of 0006: Reference to the site was deleted and clarification was provided that individuals included in the assessment are located within 1 mile of the controlled area. Additionally, the ALARA requirement was deleted; the RU believes that the term "minimized" in this requirement unnecessarily confounded the ALARA principle stipulated in other top-level standards (e.g., 4.2.3.2) and regulations (e.g., 10 CFR 835).

3.2 Radiation Protection Objective

Ensure that during normal operation radiation exposure within the facility and radiation exposure and environmental impact due to any release of radioactive material from the facility is kept as low as is reasonably achievable (ALARA) and within prescribed limits, and ensure mitigation of the extent of radiation exposure and environmental impact due to accidents.

Basis: **INSAG-3**

~~To c~~Ensure that during~~in~~ normal operation ~~that~~ radiation exposure within the facility~~plant~~ and radiation exposure and environmental impact due to any release of radioactive material from the facility~~plant~~ is kept as low as reasonably achievable (ALARA) and within~~below~~ prescribed limits, and ~~to~~ ensure mitigation of the extent of radiation exposure~~s~~ and environmental impact due to accidents.

Summary of Changes in the Development of 0006: The requirement to maintain environmental impacts due to releases of radioactive material ALARA was added.

17 For evaluation purposes, workers are assumed to be located within the controlled area.

3.3 Technical Safety Objectives

3.3.1 Public Protection

Measures in the design and operation of the facility to protect the public against accident conditions should be evaluated against acceptable guidelines to demonstrate that they perform their intended purpose with high confidence.

Basis: **INSAG-3**

~~Objective: To prevent~~Measures in the design and operation of the facility to protect the public against accident conditions should be evaluated against acceptable guidelines to demonstrate that they perform their intended purpose with high confidence ~~accidents in nuclear plants; to ensure that, for all accidents taken into account in the design of the plant, even those of very low probability, radiological consequences, if any, would be minor; and to ensure that the likelihood of severe accidents with serious radiological consequences is extremely small~~.

Summary of Changes in the Development of 0006: The INSAG-3 technical safety objective was translated to a standard and was tailored to the TWRS Privatization Contract.

3.3.2 Worker Protection

Measures in the design and operation of the facility to protect the workers against accident conditions should be evaluated using an acceptable approach to demonstrate that they perform their intended purpose with high confidence.

Basis: **Developed specifically for TWRS Privatization**

Summary of Changes in the Development of 0006: The worker protection component was added to the INSAG-3 technical safety objective based on the need to ensure the adequacy of worker protection.

3.3.3 Accident Vulnerability Mitigation

Particular care should be taken to identify, evaluate, and prevent and/or mitigate any vulnerabilities to accidents that might, by themselves, result in a release of radioactive material that exceeds acceptable levels.

Basis: **NPR**

Particular care should~~will~~ be taken to identify, evaluate, and prevent and/or mitigate any vulnerabilities to accidents that might, by themselves, result in a release of radioactive material that exceeds acceptable levels ~~the Program's quantitative safety goals~~.

Summary of Changes in the Development of 0006: The need for accidents not to exceed "quantitative safety goals" was changed to "acceptable levels."

4.0 General Radiological and Nuclear Safety Principles

The safety principles presented in this section are fundamental ways to achieve safety, which by experience, have proven to be effective and have become the basis for accepted radiological and nuclear safety practice. Although the experience base for these principles comes largely from the commercial nuclear reactor community, these principles have merit for any nuclear facility. In facilities with hazards much reduced from those of nuclear reactors, measures to accomplish these principles may be less extensive and require less complex approaches than those related to reactor safety. These principles shall be addressed in the standards and requirements identified and recommended by the Contractor.

4.1 Overall Principles

4.1.1 Defense in Depth

4.1.1.1 Defense in Depth

To compensate for potential human and mechanical failures, a defense-in-depth strategy should be applied to the facility commensurate with the hazards such that assured safety is vested in multiple, independent safety provisions, no one of which is to be relied upon excessively to protect the public, the workers, or the environment. This strategy should be applied to the design and operation of the facility.

Basis: **NPR**

To compensate for potential human and mechanical failures, a defense-in-depth strategy will be applied to the facility commensurate with the hazards~~NPR~~ such that ~~the~~ assur~~ance~~ed ~~of~~ safety is vested in multiple, independent safety provisions, no one of which is to be relied upon excessively to protect the public, the workers, or the environment. This strategy should~~will~~ be applied to the design~~,~~ and operation~~, management, and safety reviews~~ of the facility~~plant~~.

Summary of Changes in the Development of 0006: The term "commensurate with the hazards" was added in the discussion of defense-in-depth. This is an example of requiring the Contractor to tailor its strategy to the hazards consistent with the concept discussed in DOE/RL-96-0004.

4.1.1.2 Prevention

Principal emphasis should be placed on the primary means of achieving safety, which is the prevention of accidents, particularly any that could cause an unacceptable release.

Basis: **INSAG-3**

Principal emphasis should be~~is~~ placed on the primary means of achieving safety, which is the prevention of accidents, particularly any that~~which~~ could cause an unacceptable release~~severe core damage~~.

Summary of Changes in the Development of 0006: Discusses the need to prevent an "unacceptable release" rather than "severe core damage."

4.1.1.3 Control

Normal operation, including anticipated operational occurrences, maintenance, and testing, should be controlled so that facility and system variables remain within their operating ranges and the frequency of demands placed on structures, systems, and components important to safety is small.

Basis: **INSAG-3**

Normal operation, including ~~and~~ anticipated operational occurrences, maintenance, and testing, should be ~~are~~ controlled so that facility~~plant~~ and system variables remain within their operating ranges~~.~~ and ~~This reduces~~ the frequency of demands placed on ~~the~~ structures, systems, and components important to safety is small~~systems~~.

Summary of Changes in the Development of 0006: Normal operation defined to include anticipated operational occurrences, maintenance, and testing. "Safety systems" revised to include "structures, systems, and components important to safety."

4.1.1.4 Mitigation

The facility should be designed to retain the radioactive material through a conservatively designed confinement system for the entire range of events considered in the design basis. The confinement system should protect the workplace and the environment.

Basis: **INSAG-3**

The facility~~plant~~ should be~~is~~ designed to ~~be capable of~~ retain~~ing~~ the ~~bulk of the~~ radioactive material through a conservatively designed confinement system~~that might be released from fuel,~~ for the entire range of events~~accidents~~ considered in the design basis.

~~To compensate for potential human and mechanical failures, a defense in depth concept is implemented, centered on several levels of protection including successive barriers preventing the release of radioactive material to the environment. The concept includes protection of the barriers by averting damage to the plant and to the barriers themselves. It includes further measures to~~ The confinement system should protect the workplace~~public~~ and the environment ~~from harm in case these barriers are not fully effective~~.

Summary of Changes in the Development of 0006: The concept of a "conservatively designed confinement system" replaced the concept of "multiple successive barriers." This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.1.1.5 Automatic Systems

Automatic systems should be provided that would place and maintain the facility in a safe state and

limit the potential spread of radioactive materials when operating conditions exceed predetermined safety setpoints.

Basis: **INSAG-3**

Automatic systems should be~~are~~ provided that place and~~would safely shut down~~ maintain the facility~~reactor, maintain it~~ in a safe~~cooled~~ state~~,~~ and limit the potential spread of radioactive materials when~~any release of fission products that might possibly ensure, if~~ operating conditions ~~were to~~ exceed predetermined safety setpoints.

Summary of Changes in the Development of 0006: Discusses radioactive materials in general rather than fission products specifically.

4.1.1.6 Human Aspects

The human aspects of defense in depth should include a design for human factors, a quality assurance program, administrative controls, internal safety reviews, operating limits (Technical Safety Requirements), worker qualification and training, and the establishment of a safety/quality program.

Basis: **NPR**

The human aspects of defense in depth should~~will~~ include a design for human factors, a quality assurance program, administrative controls, internal ~~and independent~~ safety reviews, operating limits (T~~t~~echnical Safety Requirements~~specifications~~), worker~~personnel~~ qualification and training, and the establishment of a safety/quality program~~culture~~.

Summary of Changes in the Development of 0006: Design for human factors was included, "independent safety reviews" were replaced by "internal safety reviews," and "technical specifications" were revised to "Technical Safety Requirements."

4.1.2 Safety Responsibility

4.1.2.1 Safety Responsibility

Ultimate responsibility for the safety of the facility rests with the Contractor. In no way should this responsibility be diluted by the separate activities and responsibilities of designers, suppliers, constructors, the Regulatory Unit, or independent oversight bodies.

Basis: **INSAG-3**

~~The u~~Ultimate responsibility for the safety of the facility~~a nuclear power plant~~ rests with the Contractor~~operating organization~~. ~~This is i~~In no way should this responsibility be diluted by the separate activities and responsibilities of designers, suppliers, constructors, the R~~and r~~egulator~~s~~y Unit, or independent oversight bodies.

Summary of Changes in the Development of 0006: Independent oversight bodies were added to the groups that have separate safety responsibilities.

4.1.2.2 Safety Assignments

The assignment and subdivision of responsibility for safety should be kept well defined throughout the life of the facility.

Basis: **INSAG-3**

The assignment and subdivision of responsibility for safety should be~~are~~ kept well defined throughout the life of the facility~~design phase of a nuclear power plant project, and during any subsequent modifications~~.

Summary of Changes in the Development of 0006: Clarified that safety is important for the "life of the facility."

4.1.2.3 Site and Technical Support

The Contractor should assure commitments from relevant parties to provide data and services needed to fulfill its safety commitments.

Basis: **Developed specifically for TWRS Privatization**

Summary of Changes in the Development of 0006: This principle was developed specifically for TWRS Privatization based on the recognition that the Contractors may be uniquely dependent on site and technical support.

4.1.2.4 Operating Experience and Safety Research

Operating experience and the results of research relevant to safety should be obtained, reviewed, and analyzed, and lessons that are learned should be implemented in the design, construction or modification, and operation of the facility.

Basis: **INSAG-3**

~~Organizations concerned ensure that o~~Operating experience and the results of research relevant to safety should be~~are~~ obtained~~exchanged~~, reviewed, and analyzed, and ~~that~~ lessons that are learned should be implemented in the design, construction or modification, and operation of the facility~~and acted on~~.

Summary of Changes in the Development of 0006: Clarified that lessons learned should be implemented through all phases of the facility.

4.1.3 Authorization Basis

4.1.3.1 Authorization Basis

Material that is part of the authorization basis should be established, documented, and submitted to the Director of the Regulatory Unit for evaluation and in support of decisions and regulatory oversight. The Contractor should maintain the material current with respect to changes made to the facility design and administrative controls and in the light of significantly new safety information.

Basis: **NPR**

Material that is part of the authorization basis~~The NPR safety design basis~~ should~~will~~ be established, documented, and submitted to the Director of the Regulatory Unit for evaluation and in support of decisions and regulatory oversight. The Contractor should maintain the material current with respect to changes made to the facility design and administrative controls and in the light of significantly new safety information~~maintained throughout the life of the plant. As a minimum, it will include applicable requirements, codes, and standards; supporting calculations; design specifications and drawings; and Technical Specifications related to all structures, systems, and components important to safety.~~

Summary of Changes in the Development of 0006: The term "authorization basis" was introduced, previously it was termed "safety design basis." Provides additional detail on the establishment, maintenance, and evaluation (by the Regulatory Unit) of material that is part of the authorization basis, and deletes the specific examples of the material. This is an example of tailoring a reactor-based requirement to a requirement that is specific to TWRS Privatization.

4.1.4 Safety/Quality Culture

4.1.4.1 Safety/Quality Culture

A safety/quality program should be established that governs the Contractor's actions and interactions of all personnel and organizations engaged in activities related to the facility and emphasizes excellence in all activities. The Contractor should have safety and quality responsibilities specifically identified in its operations.

Basis: **NPR**

A safety/quality program~~culture~~ should~~will~~ be established that governs the Contractor's actions and interactions of all personnel~~individuals~~ and organizations engaged in activities related to the facility~~NPR~~ and emphasizes excellence in all activities. The Contractor~~Each program organization and participant~~ should~~will~~ have safety and quality responsibilities specifically identified in its operations~~their job assignments~~.

Summary of Changes in the Development of 0006: The term "safety culture" was revised to "safety/quality program." The need for the program to "emphasize excellence" was added. The need to identify responsibilities specifically was added.

4.1.5 Configuration Management

4.1.5.1 Formal Configuration Management

Formal configuration management should be applied to all facility activities during the program's lifetime to ensure that programmatic objectives related to radiological, nuclear, and process safety are fully achieved. Work should be performed and controlled according to pre-approved plans and procedures that clearly delineate responsibilities. Documented records should be retained.

Basis: **NPR**

Formal configuration management should~~will~~ be applied to all facility~~NPR~~ activities during the program's lifetime to ensure that programmatic objectives~~, including~~ related to radiological, nuclear, and process safety~~,~~ are fully achieved. Work should~~will~~ be performed and controlled according to pre-approved plans and procedures~~,~~ that~~with~~ clearly delineate~~d~~ responsibilities.~~,~~ ~~and~~ D~~d~~ocumented records should~~will~~ be retained.

Summary of Changes in the Development of 0006: Relevant programmatic objectives were stipulated.

4.1.5.2 Contractor Design Knowledge

The Contractor operating organizations should become and remain familiar with the features and limitations of components included in the design of the facility. They should obtain appropriate input from the design organization on pre-operational testing, operating procedures, and the planning and conduct of training.

Basis: **NPR**

The Contractor~~NPR~~ operating organizations should~~will~~ become and remain familiar with the features and limitations of components included in the design of the facility. They should~~will~~ obtain appropriate input from the design organization on pre-operational testing, operating procedures, and the planning and conduct of training.

Summary of Changes in the Development of 0006: The need for operating organizations to receive input from the design organization on pre-operational testing was added.

4.1.5.3 Design Documentation

A system should be used to control and maintain accurate during the life of the facility as-built drawings related to radiological, nuclear, and process safety.

Basis: **Developed specifically for TWRS Privatization**

Summary of Changes in the Development of 0006: This standard was developed to explicitly address configuration control.

4.1.6 Quality Assurance

4.1.6.1 Quality Assurance Application

Quality assurance and quality control should be applied throughout all phases and to all activities associated with the facility as part of a comprehensive system to ensure with high confidence that all items delivered and services and tasks performed meet required standards.

Basis: **INSAG-3**

Quality assurance and quality control should be ~~is~~ applied throughout all phases and to all activities associated with the facility ~~at a nuclear power plant~~ as part of a comprehensive system to ensure with high confidence that all items delivered and services and tasks performed meet required standards ~~specified requirements~~.

Summary of Changes in the Development of 0006: The term "quality control" was added. The need to consider "all phases" of the facility was added. The need to meet "specified requirements" was changed to "required standards."

4.1.6.2 Established Techniques and Procedures

The Contractor should use well proven and established techniques and procedures supported by quality assurance practices to provide high quality equipment and achieve high quality construction.

Basis: **INSAG-3**

The Contractor ~~plant manufacturers and constructors discharge their responsibilities for the provision of equipment and construction of high quality by~~ should us~~e~~ ~~ing~~ well proven and established techniques and procedures supported by quality assurance practices to provide high quality equipment and achieve high quality construction. (Note: sentence rearranged)

Summary of Changes in the Development of 0006: Editorial changes only.

4.1.6.3 Operational Quality Assurance Programs

Operational quality assurance and control programs should be established by the Contractor to assist in ensuring satisfactory performance in facility activities important to safety.

Basis: **INSAG-3**

~~An o~~Operational quality assurance and control programs should be ~~is~~ established by the Contractor ~~operating organization~~ to assist in ensuring satisfactory performance in facility ~~all plant~~ activities important to ~~plant~~ safety.

Summary of Changes in the Development of 0006: The term "quality control" was added.

4.2 Design, Construction, and Pre-Operational Testing

4.2.1 Design

4.2.1.1 Safety Design

The facility should be designed for a set of events such as: normal operation, including anticipated operational occurrences, maintenance, and testing; external events; and postulated accidents.

Basis: **NPR**

The facility~~NPR~~ should~~will~~ be designed for~~to cope with~~ a set of events such as: normal operation, including anticipated operational occurrences, maintenance, and testing; external events; and postulated accidents ~~conditions. For this purpose, conservative rules and criteria incorporating safety margins will be used to establish design requirements. Comprehensive analyses will be carried out to evaluate the safety performance or capability of the various structures, systems, and components important to safety.~~ (Note: last sentence was incorporated in 4.2.1.3 below)

Summary of Changes in the Development of 0006: The requirement to use conservative rules and criteria to establish design requirements was deleted. This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.2.1.2 Risk Assessment

Acceptable risk analyses should be applied during the design to delineate provisions for the prevention and mitigation, including emergency preparedness and response, of otherwise risk-dominant events.

Basis: **NPR**

Acceptable risk analysis~~Risk-related information~~ should~~will~~ be applied during the design ~~of the NPR~~ to delineate provisions for the prevention and mitigation, including emergency preparedness and response, of otherwise risk-dominant events ~~so that reasonable assurance is provided that the associated public health and safety risks have been reduced to an acceptable level~~.

Summary of Changes in the Development of 0006: Emergency preparedness and response was added. The discussion of the need to be assured that risks have been reduced was removed.

4.2.1.3 Safety Analysis

A safety analysis should be carried out as required to evaluate the safety performance of the design and identify requirements for operations.

Basis: **INSAG-3**

~~A nuclear power plant is designed to cope with a set of events including normal conditions, anticipated operational occurrences, extreme external events and accident conditions. For this~~

~~purpose, conservative rules and criteria incorporating safety margins are used to establish design requirements.~~ A safety~~Comprehensive~~ analysies should be~~are~~ carried out as required to evaluate the safety performance ~~or capability~~ of the design and identify requirements for operations~~various components and systems in the plant~~. (Note: First sentence was used in 4.2.1.1)

Summary of Changes in the Development of 0006: The term "comprehensive analysis" was changed to "safety analysis." The term "as required" was added. The need to evaluate the safety performance of the "SSCs important to safety" was changed to the "design." The need for the analysis to identify requirements for operations was added.

4.2.2 Proven Engineering Practices/Margins

4.2.2.1 Proven Engineering Practices

Safety technologies incorporated into the facility design should have been proven by experience or testing and should be reflected in approved codes and standards. Significant new design features should be introduced only after thorough research and model or prototype testing at the component, system, or facility level, as appropriate.

Basis: **INSAG-3**

Safety t~~T~~echnologies incorporated into the facility design should have been proven by experience or~~and~~ testing~~. Nuclear power technology is based on engineering practices which are proven by testing and experience,~~ and should be~~which are~~ reflected in approved codes and standards~~ and other appropriately documented statements~~. Significant new design features ~~or new reactor types~~should be~~are~~ introduced only after thorough research and model or prototype testing at the component, system, or facility~~plant~~ level, as appropriate. (Note: combination of two separate statements)

Summary of Changes in the Development of 0006: The term "and other appropriately documented statements" was removed.

4.2.2.2 Common-Mode/Common-Cause Failure

Design provisions should be included to limit the loss of safety functions due to damage to several structures, systems, or components important to safety resulting from a common-cause or common-mode failure.

Basis: **NPR**

Design provisions should~~will~~ be included to limit~~prevent~~ the loss of safety functions due to damage to several structures, systems, or components important to safety resulting from a common-cause or common-mode failure.

Summary of Changes in the Development of 0006: The term "common-mode failure" was added. The term "prevent the loss of safety functions" was changed to "limit the loss of safety functions."

4.2.2.3 Safety System Design and Qualification

Structures, systems, and components important to safety should be designed and qualified to function as intended in the environments associated with the events for which they are intended to respond. The effects of aging on normal and abnormal functioning should be considered in design and qualification.

Basis: **NPR**

Structures, systems, and components important to safety should~~will~~ be designed and qualified to function as intended in the environments associated with the events for which they are intended to respond. The effects of aging on normal and abnormal functioning should~~will~~ be considered in design and qualification.

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.2.2.4 Codes and Standards

Codes and standards for vessels and piping should be supplemented by additional measures (such as erosion/corrosion programs and piping in-service inspections) to mitigate conditions arising that could lead to an unacceptable release of radioactivity during the operational life of the facility.

Basis: **INSAG-3**

Codes and standards for ~~nuclear~~ vessels and piping should be~~are~~ supplemented by additional measures (such as erosion/corrosion programs and piping in-service inspections) to mitigate~~prevent~~ conditions arising that could lead to an unacceptable release of radioactivity~~a rupture of the primary coolant system boundary at any time~~ during the operational life of the facility~~plant~~.

Summary of Changes in the Development of 0006: Examples of erosion/corrosion programs and piping in-service inspections were added. The term "prevent" was changed to "mitigate." Discusses mitigating an "unacceptable release of radioactivity" rather than a failure specific to nuclear power plants.

4.2.2.5 Criticality

The facility should be designed and operated in a manner that prevents nuclear criticality.

Basis: **NPR**

The facility~~NPR~~ should~~will~~ be designed and operated in a manner that~~to~~ prevents ~~inadvertent~~ nuclear criticality~~ both inside and outside the reactor. Monitoring systems and appropriate process controls will be incorporated into the design~~.

Summary of Changes in the Development of 0006: The statement was simplified to provide only a general

requirement that criticality be prevented; the specific requirement for monitoring and process controls to prevent criticality was deleted. This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.2.3 Radiation Protection

4.2.3.1 Radiation Protection Practices

An acceptable system of radiation protection practices should be followed in the design, construction, and pre-operational testing phases of the facility for the protection of workers and the public.

Basis: **INSAG-3**

An acceptable system of radiation protection practices~~, consistent with recommendations of the International Commission on Radiological Protection and the International Atomic Energy Agency,~~ should be~~is~~ followed in the design, construction,~~commissioning~~ and pre-operational testing phases of the facility~~nuclear power plants~~ for the protection of workers and the public.

Summary of Changes in the Development of 0006: Specific guidance documents on radiation protection practices were deleted and the requirement was changed to an "acceptable" system. Protection of workers and the public was added. "Commissioning" phases of the facility changed to "Construction," and "Operational" phase was limited to "Pre-operational testing." (Note: The operational phase is addressed in Section 4.3.2.1).

4.2.3.2 Radiation Protection Features

At the design stage, radiation protection features should be incorporated to protect workers from radiation exposure and to keep emissions of radioactive effluents ALARA and within prescribed limits.

Basis: **INSAG-3**

At the design stage, radiation protection features should be~~are~~ incorporated to protect workers~~plant personnel~~ from radiation exposure and to keep emissions of radioactive effluents ALARA and within prescribed limits.

Summary of Changes in the Development of 0006: The ALARA concept was added.

4.2.3.3 Deactivation, Decontamination, and Decommissioning Design

The design of the facility should incorporate provisions to facilitate deactivation and the final decommissioning. The objective of these provisions should be to reduce radiation exposures to Hanford Site personnel and the public both during and following deactivation and decommissioning activities and to minimize the quantity of radioactive waste generated during deactivation, decontamination and decommissioning.

Basis: **NPR**

The design of the facility~~NPR~~ should~~will~~ incorporate provisions to facilitate deactivation and the final decommissioning ~~of the NPR~~. The objective of these provisions should~~will~~ be to reduce radiation exposures to Hanford S~~s~~ite personnel and the public both during and following deactivation and decommissioning activities and to minimize the quantity of radioactive waste generated during deactivation, decontamination and decommissioning.

Summary of Changes in the Development of 0006: The term "deactivation" was added.

4.2.4 Emergency Preparedness

4.2.4.1 Support Facilities

The facility design should provide additional capability to place and maintain the facility in a safe state following an accident if the normal control areas are expected to become uninhabitable.

Basis: **INSAG-3**

The facility~~control room is~~ design~~ed~~ should provide additional capability to place and ~~to remain habitable under normal operating conditions, anticipated abnormal occurrences and accidents considered in the design. Independent monitoring and the essential capability for control needed to~~ maintain the facility in a safe state following an accident if the ~~ultimate cooling, shutdown and confinement are provided remote from the main control room for circumstances in which the main~~ normal control areas~~room~~ are expected to ~~may~~ become uninhabitable~~ or damaged~~.

Summary of Changes in the Development of 0006: This principle was substantially revised to a general statement requiring back-up to the normal control areas, rather than providing specific requirements.

4.2.5 Inherent/Passive Safety Characteristics

Design features that enhance safety through simplified, inherent, passive, or other highly reliable means to accomplish safety functions should be employed to the maximum extent practicable.

Basis: **NPR**

Design features that enhance ~~the margins of~~ safety through simplified, inherent, passive, or other highly reliable means to accomplish safety functions should~~will~~ be employed to the maximum extent practicable.

Summary of Changes in the Development of 0006: The specific phrase “margins of safety” was reduced to the general term “safety.”

4.2.6 Human Factors

4.2.6.1 Human Error

The possibility of human error in facility operations should be taken into account in the design by facilitating correct decisions by operators and inhibiting wrong decisions and by providing means for detecting and correcting or compensating for error.

Basis: **INSAG-3**

~~Personnel engaged in activities bearing on nuclear power plant safety are trained and qualified to perform their duties.~~ The possibility of human error in facility~~nuclear power plant~~ operations should be~~is~~ taken into account in the design by facilitating correct decisions by operators and inhibiting wrong decisions~~,~~ and by providing means for detecting and correcting or compensating for error. (Note: First sentence is used in 4.3.4.1 below)

Summary of Changes in the Development of 0006: The implicit use of human factors engineering to compensate for operational human error was made an explicit requirement of the design. This is an example of increased rigor in principles based on lessons learned from the reactor industry.

4.2.6.2 Instrumentation and Control Design

Sufficient instrumentation and control capability should be provided so that under normal operating and postulated accident conditions the operators can diagnose facility conditions, place and maintain the facility in a safe state, and mitigate accidents. If necessary, measures should be provided to protect the operator in the performance of these functions.

Basis: **NPR**

Sufficient instrumentation and control capability should~~will~~ be provided ~~in a habitable control room~~ so that under normal operating and postulated accident conditions the operators can diagnose facility~~reactor~~ conditions, place and maintain the facility in a safe state~~safely shut down the reactor~~, and mitigate accidents. If necessary, measures should be provided to protect the operator in the performance of these functions.

Summary of Changes in the Development of 0006: The specific requirement of a "habitable control room" was changed to a general requirement regarding protection of the operator.

4.2.6.3 Safety Status

Parameters to be monitored in the control room should be selected and their displays should be arranged to ensure that operators have clear and unambiguous indications of the status of facility conditions important to safety, especially for the purpose of identifying and diagnosing the actuation and operation of a system or components important to safety.

Basis: **INSAG-3**

Parameters to be monitored in the control room should be~~are~~ selected~~,~~ and their displays should be~~are~~ arranged~~,~~ to ensure that operators have clear and unambiguous indications of the status of facility~~plant~~ conditions important to~~for~~ safety, especially for the purpose of identifying and

diagnosing the ~~automatic~~ actuation and operation of a ~~safety~~ system or components important to safety~~the degradation of defense in depth~~.

Summary of Changes in the Development of 0006: The requirement that the degradation of defense in depth be unambiguously indicated by control room monitoring was deleted. This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.2.7 Reliability, Availability, Maintainability, and Inspectability (RAMI)

4.2.7.1 Reliability

Reliability targets should be assigned to structures, systems, and components or functions important to safety. The targets should be consistent with the roles of the structures, systems, and components or functions in different accident conditions. Provision should be made for appropriate testing and inspection of structures, systems, and components for which reliability targets have been set.

Basis: **INSAG-3**

Reliability targets should be~~are~~ assigned to structures, systems, and components or functions important to safety ~~systems or functions~~. The targets ~~are established on the basis of the safety objectives and~~ should be~~are~~ consistent with the roles of the structures, systems, and components or functions in different accident conditions~~sequences~~. Provision should be~~is~~ made for appropriate testing and inspection of structures, systems, and components ~~and systems~~ for which reliability targets have been set.

Summary of Changes in the Development of 0006: "Safety systems or functions" was changed to "SSCs or functions important to safety." The requirement that targets be based on safety objectives was deleted and instead allows the graded approach of establishing reliability targets based on accident analysis of the SSCs.

4.2.7.2 Availability, Maintainability, and Inspectability

Structures, systems and components important to safety should be designated, designed and constructed for appropriate inspection, testing, and maintenance throughout their operating lives to verify their continued acceptability for service with an adequate safety margin.

Basis: **NPR**

Structures, systems and components important to safety should~~will~~ be designated, designed and constructed for appropriate inspection, testing, and maintenance throughout their operating lives to verify their continued acceptability for service with an adequate safety margin.

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.2.8 Pre-Operational Testing

4.2.8.1 Testing Program

A pre-operational testing program should be established and followed to demonstrate that the entire facility, especially items important to safety, have been constructed and function according to the design intent, and to ensure that weaknesses are detected and corrected.

Basis: **NPR**

A pre-operational testing program should~~will~~ be established and followed to demonstrate that the entire facility~~plant~~, ~~and~~ especially items important to safety, have been constructed and function according to the design intent, and to ensure that weaknesses are detected and corrected.

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.2.8.2 Operational Systems and Functional Testing Procedures Validation

Procedures for normal facility and systems operation and for functional tests to be performed during the operating phase should be validated as part of the pre-operational testing program.

Basis: **NPR**

Procedures for normal facility~~plant~~ and systems operation and for functional tests to be performed during the operating phase should~~will~~ be validated as part of the pre-operational testing program.

Summary of Changes in the Development of 0006: Editorial changes only.

4.2.8.3 Safety Systems Data

During pre-operational testing, detailed diagnostic data should be collected on systems and components important to safety and the initial operating parameters of the systems and components should be recorded.

Basis: **NPR**

During pre-operational testing, detailed diagnostic data should~~will~~ be collected on systems and components important to safety and the initial operating parameters of the systems and components should~~will~~ be recorded.

Summary of Changes in the Development of 0006: Editorial changes only.

4.2.8.4 Design Operating Characteristics

During the pre-operational testing program, the as-built operating characteristics of process systems, and systems and components important to safety should be determined and documented. Operating points should be adjusted to conform to values in the design basis. Training procedures and limiting conditions for operation should be modified to accurately reflect the operating characteristics of the

systems and components as built.

Basis: **NPR**

During the pre-operational testing program, the as-built operating characteristics of process systems, and systems and components important to safety should ~~will~~ be determined and documented. Operating points should ~~will~~ be adjusted to conform to ~~design~~ values in the design basis ~~and to safety analyses~~. Training procedures and limiting conditions for operation should ~~will~~ be modified to accurately reflect ~~accurately~~ the operating characteristics of the systems and components as built.

Summary of Changes in the Development of 0006: The concept of design basis was introduced.

4.3 Operation

4.3.1 Conduct of Operations

4.3.1.1 Organizational Structure

The Contractor should exert full responsibility for the safe operation of the facility through a strong, unambiguous organizational structure.

Basis: **INSAG-3**

The Contractor should ~~operating organization~~ exert~~s~~ full responsibility for the safe operation of the facility ~~a nuclear power plant~~ through a strong, unambiguous organizational structure ~~under the line authority of the plant manager~~. ~~The plant manager ensures that all elements for safe plant operation are in place, including an adequate number of qualified and experienced personnel.~~ (Note: Last sentence was used in 4.3.1.4 below)

Summary of Changes in the Development of 0006: The term "unambiguous" in reference to the organizational structure was added. The requirement that the organizational structure be under the line authority of the plant manager was deleted.

4.3.1.2 Normal Operations

Operations should be conducted in accordance with approved technical safety requirements and in strict accordance with administrative and procedural controls.

Basis: **INSAG-3**

Operations ~~of the plant~~ should be ~~is~~ conducted ~~by authorized personnel,~~ in accordance ~~ing~~ with approved technical safety requirements and in ~~to~~ strict accordance with administrative and procedural controls ~~and observing procedural discipline~~.

Summary of Changes in the Development of 0006: "Authorized personnel" was deleted and "approved

technical safety requirements" was added.

4.3.1.3 Emergency Operating Procedures

To provide a basis for suitable operator response to accident conditions, emergency operating procedures should be established, documented and approved.

Basis: **INSAG-3**

To provide a basis for suitable operator response to accident conditions~~abnormal events~~,e~~E~~mergency operating procedures should be~~are~~ established, documented, and approved ~~to provide a basis for suitable operator response to abnormal events~~. (Note: sentence was rearranged)

Summary of Changes in the Development of 0006: "Abnormal events" was changed to "accident conditions."

4.3.1.4 Readiness

The facility manager should ensure that all elements for safe facility operation are in place, including an adequate number of qualified and experienced workers. Minimum requirements also should be set for the availability of staff and equipment.

Basis: **INSAG-3**

(Note: Combination of two separate statements)

~~The operating organization exerts full responsibility for the safe operation of a nuclear power plant through a strong organizational structure under the line authority of the plant manager.~~ The facility~~plant~~ manager should ensure~~s~~ that all elements for safe facility~~plant~~ operation are in place, including an adequate number of qualified and experienced workers~~personnel~~. (Note: First sentence was used in 4.3.1.1. above)

~~A set of operational limits and conditions is defined to identify safe boundaries for plant operation.~~ Minimum requirements ~~are~~ also should be set for the availability of staff and equipment. (Note: The concept of the first sentence was captured in 4.3.1.6 below)

Summary of Changes in the Development of 0006: Only editorial changes made to this principle.

4.3.1.5 Internal Surveillance and Audits

Internal safety review procedures should be used by the Contractor to provide a continuing surveillance and audit of facility operational safety and to support the facility manager in overall safety responsibilities.

Basis: **INSAG-3**

Internal s~~S~~afety review procedures should be~~are~~ used~~maintained~~ by the Contractor~~operating organization~~ to provide a continuing surveillance and audit of facility~~plant~~ operational safety and to support the facility~~plant~~ manager in ~~his~~ overall safety responsibilities.

Summary of Changes in the Development of 0006: The word "internal" was added in reference to safety review procedures.

4.3.1.6 Operations Within the Authorization Basis

Operations should be conducted in accordance with approved TSRs. Limiting conditions of operation, limiting control settings, and safety limits should be established as necessary to ensure operation within the authorization basis.

Basis: **NPR**

Operations should~~will~~ be conducted in accordance with approved TSRs~~Technical Specifications~~. Limiting conditions of operation, limiting control~~safety system~~ settings, and safety limits should~~will~~ be established as necessary to ensure~~safe~~ operation within the authorization~~plant design~~ basis. ~~Minimum requirements also will be set for the availability of staff and equipment.~~ (Note: The last sentence was used in 4.3.1.4)

Summary of Changes in the Development of 0006: The language was revised to reflect current DOE terminology such as TSRs, LCOs, LCSs, and safety limits.

4.3.1.7 Access to Technical Safety Support

Throughout the life of the facility, the Contractor should have access to engineering and technical support personnel, who are competent in all disciplines important to safety.

Basis: **INSAG-3**

Throughout the life of the facility~~plant~~, the Contractor should have access to e~~E~~ngineering and technical support personnel who are~~,~~ competent in all disciplines important to safety~~, is available throughout the life of the plant~~. (Note: sentence rearranged)

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.3.1.8 Operational Events

Facility management should institute measures to ensure that events relevant to safety are detected and evaluated, and that necessary corrective measures are taken promptly and information on them is disseminated. Operational event reports should be prepared and submitted to the Director of the Regulatory Unit. The facility management should have access to operational safety experience from other related facilities.

Basis: **INSAG-3**

Facility~~Plant~~ management should institute~~s~~ measures to ensure that events relevant to~~significant for~~ safety are detected and evaluated~~ in depth~~, and that ~~any~~ necessary corrective measures are taken promptly and information on them is disseminated. Operational event reports should be prepared and submitted to the Director of the Regulatory Unit. The facility~~plant~~ management should have ~~has~~ access to operational safety experience ~~relevant to plant safety~~ from other related facilities~~nuclear power plants worldwide~~.

Summary of Changes in the Development of 0006: The requirement regarding operational event reports was added, and the requirement to evaluate events "in depth" was deleted. This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.3.2 Radiation Protection

4.3.2.1 Radiation Practices

An acceptable system of radiation protection practices should be followed in the operational phase for the protection of workers and public.

Basis: **INSAG-3**

An acceptable system of radiation protection practices~~, consistent with recommendations of the International Commission on Radiological Protection and the International Atomic Energy Agency~~, should be~~is~~ followed in the ~~design, commissioning and~~ operational phases~~ for the protection of workers and the public of nuclear power plants~~.

Summary of Changes in the Development of 0006: Specific guidance documents on radiation protection practices were deleted and the requirement was changed to an "acceptable" system. Protection of workers and the public was added. Design and commissioning phases of the facility were deleted. (Note: these phases were addressed in a previous requirement).

4.3.2.2 Procedures and Monitoring

The radiation protection staffs of the Contractor's operating organizations should establish written procedures for the control, guidance, and protection of personnel; and routinely monitor facility site radiological conditions; the exposure of facility personnel to radiation; and releases of radioactive effluents.

Basis: **INSAG-3**

The radiation protection staffs of the Contractor's operating organizations should establish written procedures for the control, guidance and protection of personnel;~~,~~ and~~carry out~~ routinely monitor~~ing~~ facility site~~of in-plant~~ radiological conditions;~~, monitor~~ the exposure of facility~~plant~~ personnel to radiation;~~,~~ and ~~also monitor~~ releases of radioactive effluents.

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.3.2.3 Final Deactivation Plans and Provisions

Deactivation of the facility should be planned. These plans and provisions should incorporate radiation protection practices to protect Hanford Site personnel and the public, both during and following deactivation activities, and waste minimization procedures to reduce the amount of radioactive waste generated during deactivation.

Basis: **NPR**

~~Plans and provisions for the final decommissioning of the NPR operation will be made while the NPR is in operation.~~ Deactivation of the facility should be planned. These plans and provisions should~~will~~ incorporate radiation protection practices to protect Hanford S~~s~~ite personnel and the public, both during and following deactivation~~decommissioning~~ activities, and waste minimization procedures to reduce the amount of radioactive waste generated during deactivation~~decontamination and decommissioning~~.

Summary of Changes in the Development of 0006: Reference to "decontamination and decommissioning" was changed to "deactivation." The stipulation that deactivation be planned while the facility is in operation was deleted. The timing of deactivation activities was established by the procurement strategy that is reflected in the Contract.

4.3.3 Emergency Preparedness

4.3.3.1 Offsite Measures

Hanford Site and offsite mitigation measures should be provided to substantially reduce the effects of an unacceptable release of radioactive material.

Basis: **INSAG-3**

Hanford Site~~In-plant~~ and off-~~-~~site mitigation measures should be~~are~~ provided to~~available and are prepared for what would~~ substantially reduce the effects of an unacceptable~~accidental~~ release of radioactive material.

Summary of Changes in the Development of 0006: "Accidental" release was changed to "unacceptable" release. "In-plant" was changed to "Hanford Site."

4.3.3.2 Accident Management Strategy

The results of analyses of the response of the facility to accidents with the potential for releases resulting in doses in excess of Environmental Protection Agency and the State of Washington emergency clean-up standards, beyond the facility control perimeter (security fence) should be used in preparing guidance on an accident management strategy.

Basis: **NPR**

The results of analyses of the response of the facility~~plant~~ to accidents with the potential for releases resulting in doses in excess of Environmental Protection Agency and the State of Washington emergency clean-up standards,~~guidelines~~ beyond the ~~reactor~~ facility control perimeter (security fence) should~~will~~ be used in preparing guidance on an accident management strategy.

Summary of Changes in the Development of 0006: Specific details regarding the dose standards and location were added.

4.3.3.3 Establishment and Continued Exercise of Emergency Plans

Emergency plans should be prepared before the startup of the facility, and should be exercised periodically to ensure that protection measures can be implemented in the event of an accident that results in, or has the potential for, unacceptable releases of radioactive materials within and beyond the facility control perimeter. Emergency planning zones defined around the facility should allow for the use of a graded response.

Basis: **INSAG-3**

Emergency plans should be~~are~~ prepared before the startup of the facility~~plant~~, and should be~~are~~ exercised periodically to ensure that protection measures can be implemented in the event of an accident that~~which~~ results in, or has the potential for, unacceptable~~significant~~ releases of radioactive materials within and beyond the facility control perimeter~~site boundary~~. Emergency planning zones defined around the facility~~plant~~ should allow for the use of a graded response.

Summary of Changes in the Development of 0006: "Significant" release was changed to "unacceptable" release.

4.3.4 Training and Qualifications

4.3.4.1 Personnel Training

Personnel engaged in activities bearing on facility safety should be trained and qualified to perform their duties.

Basis: **INSAG-3**

Personnel engaged in activities bearing on facility~~nuclear power plant~~ safety should be~~are~~ trained and qualified to perform their duties. ~~The possibility of human error in nuclear power plant operation is taken into account by facilitating correct decisions by operators and inhibiting wrong decisions, and by providing means for detecting and correcting or compensating for error.~~ (Note: The last sentence used in 4.2.6.1)

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.3.4.2 Training Programs

Programs should be established for continual training of operations and maintenance personnel to enable them to perform their duties safely and efficiently.

Basis: **INSAG-3**

Programs should be ~~are~~ established for continual training of ~~and retraining~~ operations and maintenance personnel to enable them to perform their duties safely and efficiently. ~~Training is particularly intensive for control room staff, and includes the use of plant simulators.~~

Summary of Changes in the Development of 0006: The requirement to provide "intensive" training (including the use of simulators) for control room staff was deleted. This is an example of a reduction in scope and breadth of a standard as discussed in Section III of the main text.

4.3.4.3 Conditions Beyond Design Basis

Operating staff should be trained and retrained in the procedures to follow if conditions exceed the design basis of the facility.

Basis: **INSAG-3**

Operating ~~Nuclear plant~~ staff should be ~~are~~ trained and retrained in the procedures to follow if conditions ~~an accident occurs that~~ exceed~~s~~ the design basis of the facility ~~plant~~.

Summary of Changes in the Development of 0006: "Accident" was changed to "conditions" in reference to exceeding the design basis.

4.3.5 Operational Testing, Inspection, and Maintenance

4.3.5.1 Operational Testing, Inspection, and Maintenance

Structures, systems, and components important to safety should be the subject of appropriate, regular preventive maintenance, inspection, and testing and servicing when needed, to ensure that they remain capable of meeting their design requirements throughout the life of the facility. Such activities should be carried out in accordance with written procedures supported by quality assurance measures.

Basis: **NPR**

Structures, systems, and components important to safety should ~~will~~ be the subject of appropriate, regular preventive maintenance, inspection, and testing and servicing when needed, to ensure that they remain capable of meeting their design requirements throughout the life of the facility ~~plant~~. Such activities should ~~will~~ be carried out in accordance with written procedures supported by

quality assurance measures.

Summary of Changes in the Development of 0006: Only editorial changes were made to this principle.

4.3.6 Security

4.3.6.1 Security

Adequate provisions for facility security and physical protection of structures, systems, and components important to safety should be provided.

Basis: **NPR**

Adequate provisions for facility~~plant~~ security~~; safeguards of nuclear material;~~ and physical protection of structures, systems, and components important to safety should~~will~~ be provided.

Summary of Changes in the Development of 0006: Reference to safeguards of nuclear material was deleted.

4.4 Internal Safety Oversight

4.4.1 Safety Review Organization

The Contractor should establish a framework for its safety review organizations that are responsible for assuring the safety of the facility. The separation between the responsibilities of the safety review organizations and those of the other organizations should remain clear so that the safety review organizations retain their independence as safety authorities.

Basis: **NPR**

The Contractor should~~DOE has~~ establish~~ed~~ a framework for its~~the NPR~~ safety review organizations that are responsible for assuring~~verifying~~ the safety of the facility~~NPR~~. The separation between the responsibilities of the ~~NPR~~ safety review organizations and those of the other~~NPR operating~~ organizations ~~and the NPR design/construction organizations~~ should~~will~~ remain clear~~,~~ so that the ~~NPR~~ safety review organizations retain their independence as safety authorities.

Summary of Changes in the Development of 0006: "Verifying" was changed to "assuring" in reference to safety review.

4.4.2 Qualified Personnel

Internal safety oversight should be conducted by qualified personnel to ensure that the safety standards are consistently met.

Basis: **Developed specifically for TWRS Privatization**

Summary of Changes in the Development of 0006: This principle was added as part of the procurement strategy.

4.4.3 Recommendation for Initiation of Construction

The Contractor should request authorization for construction only after being satisfied by appropriate internal assessments that the main safety issues have been satisfactorily resolved and that the remainder are amenable to solution before operations are scheduled to begin.

Basis: **INSAG-3**

The Contractor should request authorization for c~~C~~onstruction ~~of a nuclear power plant is begun~~ only after being~~the operating organization and the regulatory organization have~~ satisfied ~~themselves~~ by appropriate internal assessments that the main safety issues have been satisfactorily resolved and that the remainder are amenable to solution before operations are scheduled to begin.

Summary of Changes in the Development of 0006: Stipulation was added that construction cannot begin until authorization is received following satisfactory internal assessments.

4.4.4 Unresolved Safety Questions

All facility modifications after operations begin that can affect safety should be assessed by the Contractor for an "unreviewed safety question" and positive determinations submitted to the Director of the Regulatory Unit for review.

Basis: **Developed specifically for TWRS Privatization**

Summary of Changes in the Development of 0006: This principle was added as part of the procurement strategy. The heading "unresolved safety questions" is a misnomer and is intended to refer to "unreviewed safety questions" as defined in the glossary.

5.0 General Process Safety Principles

The safety principles presented in this section are fundamental ways to achieve process safety, which have been proven to be effective in the chemical industry and have become the basis for accepted process safety practice. These principles shall be used to address all process hazards associated with the Contractor's facilities. These principles shall be addressed by the Contractor in the standards identified in the Safety Requirements Document. The standards and the controls implementing these standards should be tailored to the significance of the hazard.

Note: The principles in Sections 5.1.1 through 5.1.3 are general principles that were developed specifically to address TWRS privatization. The principles in Sections 5.2.1 through 5.2.12 directly

correlate with those contained in 29 CFR 1910.119d through 29 CFR 1910.119o, respectively. Revision markings are not provided for these principles because they represent a concise summary of the principles stipulated in the regulation rather than revisions that can be readily illustrated. Although the requirements of 29 CFR 1910.119 apply only to "covered" processes, i.e., those involving quantities of chemicals that exceed specified threshold values, the top-level standards apply to all processes.

5.1 Overall Principles

5.1.1 Process Safety Management

The Contractor should use a comprehensive process safety management program to eliminate or reduce the incidence, or mitigate the consequences of accidental hazardous chemical releases, process fires, and process explosions. This program should address management practices, technologies, and procedures.

Basis: **Developed specifically for TWRS Privatization**

5.1.2 Process Safety Objective

Process safety management should confirm that the facility is properly designed, the integrity of the design is maintained, and the facility is operated according to the safe manner intended.

Basis: **Developed specifically for TWRS Privatization**

5.1.3 Process Safety Responsibility

The ultimate responsibility for process safety rests with the Contractor. In no way should this responsibility be diluted by the separate activities and responsibilities of designers, suppliers, constructors, the Regulatory Unit, or independent oversight bodies.

Basis: **Developed specifically for TWRS Privatization**

5.2 Process Safety Management Program

5.2.1 Process Safety Information

The Contractor should develop and maintain certain important information about the process. This information is intended to provide a foundation for identifying and understanding the process hazards. The process safety information includes, but is not limited to, a summary of material data, a description of each process and its operation, and equipment design data.

The information should confirm that the equipment is appropriate for the operation, that its integrity is maintained, and that it meets appropriate codes and standards.

Basis: **29 CFR 1910.119**

(d) *Process safety information*. In accordance with the schedule set forth in paragraph (e)(1) of this section, the employer shall complete a compilation of written process safety information before conducting any process hazard analysis required by the standard. The compilation of written process safety information is to enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals. This process safety information shall include information pertaining to the hazards of the highly hazardous chemicals used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(1) *Information pertaining to the hazards of the highly hazardous chemicals in the process*. This information shall consist of at least the following:

(i) Toxicity information;
(ii) Permissible exposure limits:
(iii) Physical data;
(iv) Reactivity data:
(v) Corrosivity data;
(vi) Thermal and chemical stability data; and
(vii) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.
Note: Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.

(2) *Information pertaining to the technology of the process*.

(i) Information concerning the technology of the process shall include at least the following:

(A) A block flow diagram or simplified process flow diagram (see Appendix B to this section);
(B) Process chemistry;
(C) Maximum intended inventory;
(D) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,
(E) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

(ii) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(3) *Information pertaining to the equipment in the process*.

(i) Information pertaining to the equipment in the process shall include:

(A) Materials of construction;
(B) Piping and instrument diagrams (P&ID's);

(C) Electrical classification;
(D) Relief system design and design basis;
(E) Ventilation system design;
(F) Design codes and standards employed;
(G) Material and energy balances for processes built after May 26, 1992; and
(H) Safety systems (e.g. interlocks, detection or suppression systems).

(ii) The employers shall document that equipment complies with recognized and generally accepted good engineering practices.

(iii) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operated in a safe manner.

5.2.2 Process Hazard Analysis

The Contractor should perform a process hazards analysis using acceptable industry practices. The process hazards analysis should be appropriate for the complexity of the process and the hazard. The Contractor should consider the effects of engineering and administrative controls, human factors, facility siting, and previous incidents in the hazard analysis. The Contractor should document the results of the hazards analysis including process hazards and possible safety and health effects. The Contractor should submit the results of the hazards analysis to the Director of the Regulatory Unit for evaluation and in support of authorization decisions and regulatory oversight.

One of the purposes of the hazard analysis is to evaluate the adequacy of the design and operating procedures. The Contractor should establish a system to address the findings in order to assure that the equipment and procedures provide an adequate degree of protection against accidents.

The Contractor should review and update the hazard analysis periodically to assure that the process hazards analysis is consistent with the current process.

Basis: **29 CFR 1910.119**

(e) *Process hazard analysis.*

(1) The employer shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this standard. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and control the hazards involved in the process. Employers shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than the following schedule:

(i) No less than 25 percent of the initial process hazards analyses shall be completed by May 26, 1994;

(ii) No less than 50 percent of the initial process hazards analyses shall be completed by May 26, 1995;
(iii) No less than 75 percent of the initial process hazards analyses shall be completed by May 26, 1996;
(iv) All initial process hazards analyses shall be completed by May 26, 1997;
(v) Process hazards analyses completed after May 26, 1997 which meet the requirements of this paragraph are acceptable as initial process hazards analyses. These process hazards analyses shall be updated and revalidated, based on their completion date, in accordance with paragraph (e)(6) of this section.

(2) The employer shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.

(i) What-If;
(ii) Checklist;
(iii) What-If/Checklist;
(iv) Hazard and Operability Study (HAZOP);
(v) Failure Mode and Effects Analysis (FMEA);
(vi) Fault Tree Analysis;
(vii) An appropriate equivalent methodology.

(3) The process hazard analysis shall address:

(i) The hazards of the process;
(ii) The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;
(iii) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);
(iv) Consequences of failure of engineering and administrative controls;
(v) Facility siting;
(vi) Human factors; and
(vii) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

(4) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

(5) The employer shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the

actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(6) At least every (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (e)(4) of this section, to assure that the process hazard analysis is consistent with the current process.

(7) Employers shall retain process hazard analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e)(5) of this section for the life of the process.

5.2.3 Operating Procedures

The Contractor should develop and implement written operating procedures that provide clear instruction for safely conducting activities consistent with the process safety information. The procedures should address at least the following elements: steps for each operating phase of the process, operating limits, safety and health considerations, and safety systems and their functions.

Basis: **29 CFR 1910.119**

(f) *Operating procedures*

(1) The employer shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.

(i) *Steps for each operating phase*:

(A) Initial startup;
(B) Normal operations;
(C) Temporary operations;
(D) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.
(E) Emergency Operations;
(F) Normal shutdown; and,
(G) Startup following a turnaround, or after an emergency shutdown.

(ii) *Operating limits*:

(A) Consequences of deviation; and
(B) Steps required to correct or avoid deviation.

(iii) *Safety and health considerations*:

(A) Properties of, and hazards presented by, the chemicals used in the process;
(B) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
(C) Control measures to be taken if physical contact or airborne exposure occurs;
(D) Quality control for raw materials and control of hazardous chemical inventory levels; and,
(E) Any special or unique hazards.

(iv) *Safety systems and their functions*.

(2) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(3) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.

(4) The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

5.2.4 Training

Each operator should be trained in an overview of the process and in the operating procedures. The training should include emphasis on the specific safety and health hazards, operating limits, emergency operations, and safety work practices. The employees should receive refresher training at an appropriate frequency considering the applicable standards and the nature of the hazards.

Basis: **29 CFR 1910.119**

(g) *Training—*

(1) *Initial training*.

(i) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in paragraph (f) of this section. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

(ii) In lieu of initial training for those employees already involved in operating a process on May 26, 1992, an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(2) *Refresher training*. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

(3) *Training documentation*. The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The employer shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

5.2.5 Subcontractors

The Contractor may engage a subcontractor to perform maintenance, renovations, or specialty work on, or adjacent to, the process. The Contractor should inform the subcontractor of potential hazards related to the subcontractor's work and take appropriate measures to ensure the subcontractors provide their workers with appropriate procedures and training necessary for performing their jobs safely.

Basis: **29 CFR 1910.119**

(h) *Contractors—*

(1) *Application*. This paragraph applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

(2) *Employer responsibilities*.

(i) The employer, when selecting a contractor, shall obtain and evaluate information regarding the contract employer's safety performance and programs.

(ii) The employer shall inform contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.
(iii) The employer shall explain to contract employers the applicable provisions of the emergency action plan required by paragraph (n) of this section.
(iv) The employer shall develop and implement safe work practices consistent with paragraph (f)(4) of this section, to control the entrance, presence and exit of contract employers and contract employees in covered process areas.
(v) The employer shall periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3) of this section.
(vi) The employer shall maintain a contract employee injury and illness log related to the contractor's work in process areas.

(3) *Contract employer responsibilities*.

(i) The contract employer shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

(ii) The contract employer shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(iii) The contract employer shall document that each contract employee has received and understood the training required by this paragraph. The contract employer shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

(iv) The contract employer shall assure that each contract employee follows the safety rules of the facility including the safe work practices required by paragraph (f)(4) of this section.

(v) The contract employer shall advise the employee of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

5.2.6 Pre-startup Safety Review

The Contractor should perform a pre-startup safety review for the facility. Pre-startup reviews also should be performed prior to restarting the process after significant modifications have been made to the facility. The pre-startup review should confirm that prior to the introduction of hazardous materials that construction and equipment is in accordance with design specifications; safety operating, maintenance, and emergency procedures are in place; an adequate process hazards evaluation has been performed and the recommendations resolved; and training of employees has been completed. The results of this review should be submitted to the Director of the Regulatory Unit for evaluation and in support of authorization decisions and regulatory oversight.

Basis: **29 CFR 1910.119**

(i) *Pre-startup safety review*.

(1) The employer shall perform a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.

(2) The pre-startup safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:

(i) Construction and equipment is in accordance with design specifications;
(ii) Safety, operating, maintenance, and emergency procedures are in place and are adequate;
(iii) For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, paragraph (1).

(iv) Training of each employee involved in operating a process has been completed.

5.2.7 Mechanical Integrity

The Contractor should implement a mechanical integrity program that includes written procedures, training for maintenance activities, inspection and performance testing of process equipment, and quality assurance measures. The program should include measures to correct deficiencies in equipment that are outside acceptable limits.

Note: A mechanical integrity program is a major and necessary element in a process safety management program because of its importance in ensuring equipment integrity, eliminating potential ignition sources, and for determining that equipment is designed, installed, and operating properly.

Basis: **29 CFR 1910.119**

(j) *Mechanical integrity—*

(1) *Application*. Paragraphs (j)(2) through (j)(6) of this section apply to the following process equipment:

(i) Pressure vessels and storage tanks;
(ii) Piping systems (including piping components such as valves);
(iii) Relief and vent systems and devices;
(iv) Emergency shutdown systems;
(v) Controls (including monitoring devices and sensors, alarms, and interlocks); and,
(vi) Pumps.

(2) *Written procedures*. The employer shall establish and implement written procedures to maintain the ongoing integrity of process equipment.

(3) *Training for process maintenance activities*. The employer shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

(4) *Inspection and testing*.

(i) Inspections and tests shall be performed on process equipment.
(ii) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
(iii) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.
(iv) The employer shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the

person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

(5) *Equipment deficiencies*. The employer shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in paragraph (d) of this section) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

(6) *Quality assurance*.

(i) In the construction of new plants and equipment, the employer shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.
(ii) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.
(iii) The employer shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

5.2.8 Hot Work Control

The Contractor should control hot work operations performed in or near the process or facility in order to ensure appropriate safety precautions, including fire prevention and protection, are taken prior to the work.

Basis: **29 CFR 1910.119**

(k) *Hot work permit*.

(1) The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.

(2) The permit shall document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

5.2.9 Management of Change

The Contractor should evaluate all planned changes involving the technology of the process and the facility design and operation in order to ensure that the impact on safety is analyzed and acceptable and to determine the need for modifications to operating procedures. The Contractor should establish and implement written procedures to manage changes to process chemicals, technology, equipment, and procedures; and changes to facilities. These procedures should address the technical basis for the proposed changes, impact of the changes on process safety, modification of the operating procedures, the schedule for proposed changes, and authorization for proposed changes.

Basis: **29 CFR 1910.119**

(l) *Management of change*.

(1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.

(2) The procedures shall assure that the following considerations are addressed prior to any change:

(i) The technical basis for the proposed change;
(ii) Impact of change on safety and health;
(iii) Modifications to operating procedures;
(iv) Necessary time period for the change; and,
(v) Authorization requirements for the proposed change.

(3) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

(4) If a change covered by this paragraph results in a change in the process safety information required by paragraph (d) of this section, such information shall be updated accordingly.

(5) If change covered by this paragraph results in a change in the operating procedures or practices required by paragraph (f) of this section, such procedures or practices shall be updated accordingly.

5.2.10 Incident Investigation

The Contractor should investigate each incident which results in, or could reasonably have resulted in, a major accident. The investigation should be conducted promptly and appropriate corrective measures should be recommended and implemented. The results of the investigation should be submitted to the Director of the Regulatory Unit for evaluation and in support of regulatory oversight.

Basis: **29 CFR 1910.119**

(m) *Incident investigation*.

(1) The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.

(2) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(3) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(4) A report shall be prepared at the conclusion of the investigation which includes at a minimum:

(i) Date of incident;
(ii) Date investigation began;
(iii) A description of the incident;
(iv) The factors that contributed to the incident; and,
(v) Any recommendations resulting from the investigation.

(5) The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

(6) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

(7) Incident investigation reports shall be retained for five years.

5.2.11 Emergency Planning and Response

The Contractor should establish and implement an emergency action plan in accordance with the applicable standards.

Basis: **29 CFR 1910.119**

(n) *Emergency planning and response*. The employer shall establish and implement an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38(a). In addition, the emergency action plan shall include procedures for handling small releases. Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120 (a), (p) and (q).

5.2.12 Compliance Audits

The Contractor should conduct a compliance audit periodically to certify that the procedures and practices developed under the process safety management program are adequate and are being followed. The frequency of compliance audits is based on the applicable standards and the nature of the process hazards. The Contractor should promptly determine and document an appropriate response to each finding of the compliance audit. The results of the audits should be available to the Director of the Regulatory Unit in support of regulatory oversight.

Basis: **29 CFR 1910.119**

(o) Compliance Audits.

(1) Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.

(2) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(3) A report of the findings of the audit shall be developed.

(4) The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(5) Employers shall retain the two (2) most recent compliance audit reports.

APPENDIX B: SOURCES OF GLOSSARY DEFINITIONS

Source References Identified in this Appendix

10 CFR 20. "Standards for Protection Against Radiation," U.S. Nuclear Regulatory Commission, Washington, DC, 1991.

10 CFR 50. "Domestic Licensing of Production and Utilization Facilities," U.S. Nuclear Regulatory Commission, Washington, DC, 1956.

10 CFR 835. "Occupational Radiation Protection," U.S. Department of Energy, Washington, DC, 1993.

29 CFR 1910. "Occupational Safety and Health Standards," Occupational Safety and Health Administration, U.S. Department of Labor, Washington, DC, 1992.

AICHe Guidelines. "Guidelines for Technical Management of Chemical Process Safety," Center for Chemical Process Safety, American Institute of Chemical Engineers, New York, 1989

DNFSB/Tech-5. "Fundamentals for Understanding Standards-Based Safety Management of DOE Defense Nuclear Facilities," Defense Nuclear Facilities Safety Board, Washington, DC, 1995.

DOE-DP-STD-3005-93 (Proposed). "DOE Standard - Definitions and Criteria for Accident Analysis," U.S. Department of Energy, Washington, DC, 1993.

DOE/EH-0256T. "Radiological Control Manual," Rev. 1, U.S. Department of Energy, Washington, DC, 1994.

DOE/EH/-0416. "Criteria for the Department's Standards Program," U.S. Department of Energy, Washington, DC, 1994.

DOE Glossary. "Glossary of Terms," U.S. Department of Energy, Washington, DC (maintained on the Internet).

DOE Order 5480.21. "Unreviewed Safety Questions," U.S. Department of Energy, Washington, DC, 1991.

DOE Order 5480.22. "Technical Safety Requirements," U.S. Department of Energy, Washington, DC, 1992.

DOE Order 5480.23. "Nuclear Safety Analysis Reports," U.S. Department of Energy, Washington, DC, 1992.

INSAG-3. "Basic Safety Principles for Nuclear Power Plants," International Nuclear Safety Advisory Group, International Atomic Energy Agency, Vienna, 1988.

NPR. "General Safety Requirements Document for the New Production Modular High Temperature Gas-Cooled Reactor," DOE/NP HWR-GSR-0001, Rev. 1, U.S. Department of Energy, Washington, DC, 1991.

None. When "None" is offered as the source of a definition, this indicates that there is no known comparable

definition in an official regulation, standard, order, or guidance document. In these cases the definition was developed specifically by the authors of the Regulatory Unit governing documents.

Acceptable Release. The release of radioactive material, within acceptable limits, to the environment.

Source of Definition: None

Discussion: Developed for TWRS Privatization. A comparable term to reactor application of the expression "large release" was developed to provide more flexible specification of releases that are acceptable based on standards and safety considerations.

Anticipated Operational Occurrences. Conditions of normal operation expected to occur one or more times during the life of the facility and include, but are not limited to, loss of off-site power to the process activity within the facility.

Source of Definition: NPR:

> "~~Anticipated operational occurrences mean those c~~Conditions of normal operation ~~which are~~ expected to occur one or more times during the life of the facility~~production reactor~~ and include, but are not limited to, loss of off-site power to the process activity within the facility~~all recirculation pumps and loss of all offsite power~~."

Discussion: Also defined in the DOE Glossary and DOE 6430.1A, but these definitions are dissimilar.

Authorization Agreement. The document mutually agreed upon by the Director of the Regulatory Unit and a regulated Contractor that specifies authorization terms and conditions.

Source of Definition: None

Discussion: Developed for TWRS Privatization.

Authorization Basis. The composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which the Director of the Regulatory Unit grants permission to perform regulated activities.

Source of Definition: DOE Order 5480.21

> "~~Those aspects of the facility design basis and operational requirements relied upon by DOE to authorize operation~~The composite of information provided by a Contractor in response to radiological, nuclear, and process safety requirements that is the basis on which the Director of the Regulatory Unit grants permission to perform regulated activities."

Discussion: The DOE definition was broadened to be consistent with the TWRS regulatory process which has a number of authorization steps rather than just an authorization for operations.

Back-fit. The addition, elimination, or modification of 1) structures, systems, or components of the facility or 2) procedures or organizations required to operate the facility after the construction authorization has been issued.

Source of Definition: DOE Glossary:

> "~~The imposition of a new or proposed nuclear safety requirement which dictates t~~The addition, elimination, or modification of~~, or addition to:~~ 1) ~~systems,~~ structures, systems, or~~and~~ components of the~~a~~ facility or~~;~~ 2) ~~the existing or approved design of a facility; or 3) the~~ procedures or organization required to ~~design, construct, or~~ operate the~~a~~ facility after the construction authorization has been issued."

Discussion: Definition appears to have originated in 10 CFR 50.109.

Catastrophic Release. A major uncontrolled emission, fire, or explosion involving one or more highly hazardous chemicals that presents serious danger to employees in the work place.

Source of Definition: 29 CFR 1910.119:

> "~~Catastrophic Release means a~~A major uncontrolled emission, fire, or explosion involving one or more highly hazardous chemicals~~,~~ that presents serious danger to employees in the work place."

Discussion: Changes to the definition were editorial only.

Co-located Worker. An individual within the Hanford Site, beyond the Contractor-controlled area, performing work for or in conjunction with DOE or utilizing other Hanford Site facilities.

Source of Definition: DOE-DP-STD-3005-93 (Proposed).

> ~~"A worker in a fixed population outside the day-to-day process safety management controls of a given facility area. In practice, this fixed population is normally the workers at an independent facility area located some distance from the reference facility area."~~

> An individual within the Hanford Site, beyond the Contractor-controlled area, performing work for or in conjunction with DOE or utilizing other Hanford Site facilities.

Discussion: Derivation of the definition from the source document incorporated a change that all facility workers under the administrative control of the Contractor were excluded from co-located worker status. This topic is discussed in detail in RL/REG-98-18, "Regulatory Unit Position on Radiological Safety for Hanford Co-located Workers."

Common-Cause Failures. Dependent failures that are caused by a condition external to a system or set of components that make system or multiple component failures more probable than multiple independent failures.

Source of Definition: NPR:

> "~~Common-cause failures mean d~~Dependent failures that~~which~~ are caused by a condition external to a system or set of components that make~~s~~ system or multiple component failures more probable than multiple independent failures."

Discussion: Changes to the definition were editorial only.

Common-Mode Failures. Dependent failures caused by susceptibilities inherent in certain systems or components that make their failures more probable than multiple independent failures due to those components having the same design or design conditions that would result in the same level of degradation.

Source of Definition: NPR:

> "~~Common-mode failures mean d~~Dependent failures caused by susceptibilities inherent in certain systems or components that~~which~~ make~~s~~ their failures more probable than multiple independent failures~~,~~ due to those components having the same design or design conditions that~~which~~ would result in the same level of degradation."

Discussion: Changes to the definition were editorial only.

Contractor(s). The private company(ies) selected to contract with DOE for construction and operation of the technologies and facilities necessary to retrieve, process tank waste, and deliver treated waste products to DOE for storage or disposal.

Source of Definition: None

Discussion: The DOE Glossary, DOE Orders 5480.21, 5480.22 and 5480.23, and 10 CFR 820 contain varying definitions that are dissimilar. This definition was developed to be specific to the TWRS Privatization Contractors.

Contractor Representative (CR). The top manager of the Contractor Organization that has direct responsibility, accountability, and authority for performing the TWRS Privatization work subject to the set of standards.

Source of Definition: DOE/EH-0256T

Discussion: DOE/EH-0256T (the DOE Radiological Control Manual) contains a definition for "contractor senior site executive" that is dissimilar. This definition was developed to be specific to the TWRS Privatization Contractors.

Contractor-recommended set of standards and requirements. Those standards and requirements identified through a DOE-specified process and recommended by the Contractor Representative as necessary assurance that work will be performed in a manner that protects the workers, the public, and the environment from the actual hazards identified for the Contractor's specific work activities. (Also see the definition for "Requirements.") The recommended set serves as a basis for DOE review and approval by the Director of the Regulatory Unit, and the Contractor's issuance of the Safety Requirements Document.

Source of Definition: None

Discussion: Developed for TWRS Privatization. This definition was developed for TWRS Privatization

Control Strategy. A set of generally described provisions (barriers, dilution/dispersal, physical limitations on material quantities, administrative material controls, confinement, ventilation of flammable gas, etc.) and/or approaches (defense in depth, use of passive features, prevention, mitigation, etc.) which are intended to ensure adequate control of a specific hazard and associated accidents in the context of the work.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization.

Controlled Area. The physical area enclosing the facility by a common perimeter (security fence). Access to this area can be controlled by the Contractor. The controlled area may include identified restricted areas.

Source of Definition: None

Discussion: The DOE Radiological Control Manual, 10 CFR 835 and 10 CFR 20 contain dissimilar definitions. This definition was developed to be consistent with the co-located worker concept. The inclusion of the term "security fence" was intended as an example, as the security fence may delineate a restricted area within the controlled area.

Deactivation Safety Evaluation Report. The document approved and issued by the Director of the Regulatory Unit that addresses the adequacy of the authorization basis for deactivation.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization.

Defense in Depth. The fundamental principle underlying the safety technology of the facility centered on several levels of protection including successive barriers preventing the release of radioactive materials to the workplace or environment. Human aspects of defense in depth are considered to protect the integrity of the barriers, such as quality assurance, administrative controls, safety reviews, operating limits, personnel qualification and training, and safety program. Design provisions, including both those for normal facility systems and those for systems important to safety help to: 1) prevent undue challenges to the integrity of the physical barriers; 2) prevent failure of a barrier if it is challenged; 3) where it exists, prevent consequential damage to multiple barriers in series; and 4) mitigate the consequences of accidents. Defense in depth helps to assure that two basic safety functions (controlling the process flow and confining the radioactive material) are preserved and that radioactive materials do not reach the worker, public, or the environment.

Source of Definition: NPR:

> "~~Defense in depth means that~~The fundamental principle underlying the safety technology of the facility~~NPR,~~ centered on several levels of protection including successive barriers preventing the release of radioactive materials to the workplace or environment. Human aspects of defense in depth are considered to protect the integrity of the barriers, such as quality assurance, administrative controls, safety reviews, operating limits, personnel qualification~~s~~ and training, and safety program~~culture~~. Design provisions, including both those for normal facility~~plant~~ systems and those for ~~engineered safety~~ systems important to safety~~,~~ help to: ~~(~~1) prevent undue challenges to the integrity of the physical barriers~~;~~ ~~(~~2) prevent failure of a barrier if it is challenged~~;~~ ~~(~~3) where it exists, prevent consequential damage to multiple barriers in series~~;~~ and ~~(~~4) mitigate the consequences of accidents. Defense in depth helps to assure~~establish~~ that two~~three~~ basic safety functions (controlling the process flow~~power, cooling the fuel and targets,~~ and confining the radioactive material) are preserved~~,~~ and that~~the~~ radioactive materials do not reach the worker, public, or the environment."

Discussion: Changes were primarily editorial, and terms specific to reactors were removed.

Design Basis. The information that identifies the specific functions to be performed by structures, systems, or components of the facility and the specific values or ranges of values chosen for controlling parameters as reference bounds for design.

Source of Definition: 10 CFR 50:

> "~~Design bases means that~~The information~~,~~ that~~which~~ identifies the specific functions to be performed by ~~a~~ structures, systems, or components of the~~a~~ facility and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state of the art" practices for achieving functional goals, or (2) requirements derived from analysis (based on calculation and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals."

Discussion: The NPR definition is essentially the same as the 10 CFR 50 definition. The DOE Glossary and DOE Orders 5480.21 and 5480.23 also contain definitions, but these are dissimilar.

Design-Basis Events. Postulated events providing bounding conditions for establishing the performance requirements of structures, systems, and components that are necessary to: 1) ensure the integrity of the safety boundaries protecting the worker; 2) place and maintain the facility in a safe state indefinitely; or 3) prevent or mitigate the event consequences so that the radiological exposures to the general public or the workers would not exceed appropriate limits. The Design-Basis Events also establish the performance requirements of the structures, systems and components whose failure under Design-Basis Event conditions could adversely affect any of the above functions.

Source of Definition: NPR:

> "~~Design-basis events (DBEs) mean those p~~Postulated events providing bounding conditions for establishing the performance requirements of structures, systems, and components that are necessary to: ~~(~~1) ensure the integrity of the safety~~reactor coolant or moderator pressure~~ boundaries protecting the worker;~~,~~ ~~(~~2) place~~shutdown the reactor~~ and maintain the facility~~it~~ in a safe~~,~~ state~~shutdown condition~~ indefinitely;~~,~~ or ~~(~~3) prevent or mitigate the event consequences so that the radiological exposures to the general public or the workers would~~are~~ not exceed~~in excess of~~ appropriate limits. The DBEs also establish the performance requirements of the structures, systems~~,~~ and components whose failure under DBE conditions could adversely affect any of the above functions."

Discussion: The DOE Glossary, DOE Orders 5480.21 and 6430.1A, and 10 CFR 830 have definitions of "design basis accidents", but these are dissimilar.

Director of the Regulatory Unit (DRU). An individual who has been delegated the authority to execute the radiological, nuclear, and process safety regulation of TWRS Privatization Contractors.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization to facilitate specific reference to the regulatory authorities.

DOE-Customer. A DOE employee who has knowledge of the equipment, facilities, and processes necessary for performance by the Contractor of the work activities to deliver the contracted services.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization.

ESH Standards Experts (ESE). Individuals with knowledge and expertise relevant to the radiological, nuclear, or process standards and requirements in a particular environment, safety, and health discipline.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization.

Facility. Those buildings and equipment directed to a common purpose and those activities and supporting elements occurring at a single location.

Source of Definition: DOE Radiological Control Manual:

> "~~... a facility includes systems,~~Those buildings~~, utilities,~~ and equipment~~related activities whose use is~~ directed to a common purpose and those activities and supporting elements occurring at a single location.~~ Examples include: accelerators, storage areas, test loops, nuclear reactors, radioactive waste disposal systems and burial grounds, testing laboratories, research laboratories, and accommodations for analytical examinations or components. Also includes: pipelines, ponds, impoundments, landfills and the like, and motor vehicles, rolling stock, and aircraft.~~"

Discussion: The DOE Glossary has four definitions, one of which is similar, and varying definitions are provided in DOE 6430.1A, DOE 5000.3B, and 29 CFR 1910.119.

Final Safety Evaluation Report. The document approved and issued by the Director of the Regulatory Unit that addresses the adequacy of the authorization basis for operation.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization.

Hazard. A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel, damage to an operation, or to the environment (without regard for the likelihood or credibility of accident scenarios or consequence mitigation).

Source of Definition: DOE 5480.23:

> "~~Hazard means a~~A source of danger (i.e., material, energy source, or operation) with the potential to cause illness, injury, or death to personnel~~, or~~ damage to an operation, ~~facility~~ or to the environment (without regard for the likelihood or credibility of accident scenarios or consequence mitigation).

Discussion: The DOE Glossary contains a dissimilar definition.

Hazards Assessment Experts (HAE). Individuals with the knowledge, skills and abilities to identify, based on examination of the work activities defined, the hazards associated with the work activities, as well as the risk to the workers, public and environment attributable to those hazards.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Hazards Control Experts (HCE). Individuals with knowledge, skills and abilities to identify, based on examination of the work activities and associated hazards, the controls necessary to mitigate the hazards to an acceptable level.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Highly Hazardous Chemical. A substance possessing toxic, reactive, flammable, or explosive properties as defined by 29 CFR 1910.119.

Source of Definition: 29 CFR 1910.119:

> "~~Highly hazardous chemical means a~~A substance possessing toxic, reactive, flammable or explosive properties ~~and~~ as defined~~specified~~ by paragraph (9)(1) of this Section."

Discussion: The changes were editorial only.

Important to Safety. Structures, systems, and components that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public. It encompasses the broad class of facility features addressed (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles that contribute to the safe operation and protection of workers and the public during all phases and aspects of facility operations (i.e., normal operation as well as accident mitigation).

This definition includes not only those structures, systems, and components that perform safety functions and traditionally have been classified as safety class, safety-related or safety-grade, but also those that place frequent demands on or adversely affect the performance of safety functions if they fail or malfunction, i.e., support systems, subsystems, or components. Thus, these latter structures, systems, and components would be subject to applicable top-level radiological, nuclear, and process safety standards and principles to a degree commensurate with their contribution to risk. In applying this definition, it is recognized that during the early stages of the design effort all significant systems interactions may not be identified and only the traditional interpretation of important to safety, i.e., safety-related may be practical. However, as the design matures and results from risk assessments identify vulnerabilities resulting from non-safety-related equipment, additional structures, systems, and components should be considered for inclusion within this definition.

Source of Definition: NPR:

> "~~Important to safety means those s~~Structures, systems and components that serve to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the workers and the public. It encompasses the broad class of facility~~plant~~ features~~,~~ addressed~~covered~~ (not necessarily explicitly) in the top-level radiological, nuclear, and process safety standards and principles~~General Safety Requirements,~~ that contribute ~~in an important way~~ to the safe operation and protection of the public during~~in~~ all phases and aspects of facility operations (i.e.~~that is~~, normal operation~~s~~ as well as accident mitigation).
>
> This definition includes not only those structures, systems, and components that perform safety functions and traditionally have been classified as safety class, safety-related or safety-grade, but also those that place frequent demands on or adversely affect the performance of safety functions if they

fail or malfunction, i.e., support systems, subsystems, or components. Thus, these latter structures, systems, and components would be subject to applicable top-level radiological, nuclear, and process safety standards and principles~~GSR~~ to a degree commensurate with their contribution to risk. In applying this definition, it is recognized that during the early stages of the design effort~~,~~ all significant systems interactions may not be identified and only the traditional interpretation of important to safety, i.e., ~~(~~safety-related~~)~~ may be practical. However, as the design matures and results from ~~probabilistic~~ risk assessments identify vulnerabilities resulting from non-safety-related equipment, additional structures, systems, and components should~~may~~ be considered~~included~~ within this definition."

Discussion: Edited to ensure consistency with the TWRS Privatization concept.

Independent Oversight. Authorized oversight by bodies or groups having no financial, programmatic, or other direct interest in the activities or organizations under review and which are totally free of management relationships with those activities or organizations.

Source of Definition: None

Discussion: This glossary term was developed for the TWRS Privatization.

Independent Oversight Bodies. Independent Oversight Bodies are those established organizations that have no financial, programmatic, or other direct interest in and are outside the management structure of the Contractor and the Regulatory Unit. The independent oversight bodies include personnel qualified and skilled to critique, evaluate, and recommend that the regulatory oversight provided by the Regulatory Unit of the Contractor is effective.

Source of Definition: None

Discussion: Developed for the TWRS Privatization regulatory process and for use in the TWRS top-level safety standards and principles as a project specific reference.

Independent Review Team (IRT). A group of individuals with the appropriate knowledge and expertise to review the recommended standards set for completeness, credibility, and adequacy before the standards are recommended by the Contractor Representative to the Director of the Regulatory Unit.

Source of Definition: None

Discussion: Developed for TWRS Privatization.

Initial Safety Evaluation Report. The document, approved and issued by the Director of the Regulatory Unit, that addresses the capability or potential for obtaining future authorizations for construction, operation, and deactivation.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization. The DOE Glossary has a definition of "Safety Evaluation Report," which is dissimilar.

Integrated Safety Management Plan (ISMP) Evaluation Report. The document, approved and issued by the Director of the Regulatory Unit, that addresses the adequacy of the Contractor's Integrated Safety Management Program as reflected in its Integrated Safety Management Plan.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Integrated Safety Management Program. A set of integrated activities that is directed toward the management or control of radiological, nuclear, and process hazards such that adequate protection is provided to workers, the public, and the environment.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Limiting Conditions for Operations (LCO). The lowest functional capability or performance level of equipment required for safe operation of the facility.

Source of Definition: DOE Order 5480.22, Section 9 e (3) (b):

> "~~Limiting Conditions for Operation are t~~The lowest functional capability or performance level of equipment~~safety related structures, systems, component and their support systems~~ required for ~~normal~~ safe operation of the facility.~~ This subsection of the TSR shall contain the limits on functional capability or performance level. When a Limiting Condition for Operation is not met, the contractor shall take remedial actions defined by the Technical Safety Requirements until the condition can be met. The LCO shall describe the action to be taken in case of exceedance of the LCO. In cases of exceedance of the LCO, the contractor shall notify DOE in accordance with DOE 5000.3A, review the matter, and record the results of the review including the cause of the condition and the basis for any corrective actions taken to preclude reoccurrence.~~"

Discussion: 10 CFR 830 contains a definition that is similar to the first sentence of the definition in DOE Order 5480.22.

Limiting Control Settings (LCS). The settings for automatic alarm or protection devices related to those variables having significant safety functions.

Source of Definition: DOE Order 5480.22, Section 9 e (3)(a):

> "~~Limiting Control Settings are settings on safety systems that control process variables to prevent exceeding Safety Limits. This subsection of the Technical Safety Requirements shall contain t~~The settings for automatic alarms~~ and automatic~~ or ~~non-automatic initiation of~~ protection~~ve~~ devices~~actions~~ related to those variables having significant safety functions.~~ The specific settings shall be chosen such that if exceeded, sufficient time is available to automatically or manually correct the condition prior to exceeding Safety Limits. If the automatic alarms or protective devices do not function as required during applicable operating modes, the contractor shall take action as defined in the Limiting Control Setting to maintain the variables within the requirements and to promptly repair the automatic devices or the affected part of the process or, it required, the facility shall be place in its most safe, stable condition. The LCE shall describe the action to be taken in case of exceedance of LCS. If an LCE is exceeded, the contractor shall notify DOE in accordance with DOE 5000.3A, review the matter, and record the results of the review including the cause of the condition and the basis for any corrective actions taken to preclude reoccurrence.~~"

Discussion: 10 CFR 830 contains a definition that is roughly similar to the first sentence of the definition in DOE Order 5480.22.

Margin of Safety. The level of confidence that is assigned to the integrity of radiological control measures such as confinement barriers. It is defined as the range between the design acceptance limits and the design failure point of the control feature. The design acceptance limits for radiological control measures such as confinement barriers are established during the design of the facility. These criteria are given in terms of those physical parameters that define their performance. Whenever the values of the design acceptance limits are exceeded, the margin of safety, and therefore the confidence in the integrity of the control feature, is decreased.

Source of Definition: NPR:

> "~~Margin of safety means t~~The level~~s~~ of confidence that is assigned to~~in~~ the integrity of radiological control measures such as confinement~~the fission product~~ barriers. It is defined as the range between the design acceptance limits and the design failure point of the control feature~~or system limitation for the fission product barriers~~. The design acceptance ~~criteria~~ limits for radiological control measures such as confinement barriers~~the reactor core and internals, reactor coolant and moderator systems pressure boundaries, and containment~~ are established during the design of the facility~~a plant~~. These criteria are given in terms of those physical parameters that define their performance~~ of the fission product barriers~~. Whenever the values of the design acceptance ~~criteria~~ limits are exceeded, the margin of safety, and therefore the confidence in the integrity of the control feature,~~barrier(s)~~ is decreased."

Discussion: Terms specific to nuclear reactors were removed.

Normal Operation. Steady-state operation and those departures from steady-state operation that are expected frequently or regularly in the course of facility operation, system testing, and maintenance. It includes conditions such as startup, shutdown, standby, anticipated operational occurrences, operation with specific equipment out of service as permitted by the approved operational constraints, and routine inspection, testing, and maintenance of components and systems during any of these conditions if it is consistent with the approved operational constraints.

Source of Definition: NPR:

> "~~Normal operation means s~~Steady-state operation and those departures from steady-state operation that are expected frequently or regularly in the course of facility~~power~~ operation, system testing~~refueling~~, and maintenance. It includes conditions such as startup, shutdown, standby, anticipated operational occurrences, ~~limited fuel leakage as permitted by the Technical Specifications,~~ operation with specific equipment out of service as permitted by the approved operational constraints~~Technical Specifications~~, and routine inspection, testing, and maintenance of components and systems during any of these conditions~~,~~ if it is consistent with the approved operational constraints~~Technical Specifications~~."

Discussion: Terms specific to nuclear reactors were removed.

Off-site. The area outside the perimeter of the Hanford Site.

Source of Definition: NPR:

> "~~Off-site means that~~The area outside ~~of~~ the ~~reactor facility control~~ perimeter of the Hanford

> Site~~(security fence), and is not limited to the area outside of the DOE reservation. Offsite power systems serving the NP-HWR may differ from those for a commercial light water reactor in that the DOE reservation on which the NP-HWR is constructed may have on-reservation power generation facilities that serve various DOE facilities, including the NP-HWR. In this context, the phrase "offsite power system" is intended to include both the power systems that are off of the DOE reservation and those power systems on the DOE reservation that serve the NP-HWR but are not fully dedicated to supporting it~~."

Discussion: Definition was tailored to the Hanford Site.

On-site. The area within the Hanford Site control perimeter, which is under the jurisdiction of DOE.

Source of Definition: NPR:

> "~~Onsite means that~~The area within the Hanford Site~~reactor facility~~ control perimeter, which is under the jurisdiction of DOE ~~(security fence). However, onsite power systems serving the NP-HWR may differ from those for a commercial reactor in that power systems outside the reactor facility control perimeter but on the DOE reservation, including safety-related emergency power supplies, that are fully dedicated to serving the NP-HWR are considered 'onsite'~~."

Discussion: Definition was tailored to the Hanford Site.

Oversight Safety Determination. The oversight of the Contractors performed by the Regulatory Unit to ensure continuing compliance to an authorization agreement.

Source of Definition: None

Discussion: Developed for TWRS Privatization.

Postulated Accidents. Events, including the design-basis events, that would have an adverse affect on the facility process but which do not have a significant probability of occurrence during the life of the facility and include, but are not limited to, pipe or tank failures.

Source of Definition: NPR:

> "~~Postulated accidents mean those e~~Events, including the design-basis events, that would have an adverse affect on the facility process~~reactor~~ but~~,~~ which do not have a significant probability of occurrence during the life of the facility~~production reactor,~~ and include, but are not limited to, pipe or tank failures~~loss-of-coolant and anticipated transients without scram (ATWS).~~"

Discussion: Terms specific to nuclear reactors were removed.

Preliminary Safety Evaluation Report. The document, approved and issued by the Director of the Regulatory Unit, that addresses the adequacy of the authorization basis for construction.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Process. Any activity involving a highly hazardous chemical including use, storage, manufacturing, handling,

or the on-site movement of such chemicals, or a combination of these activities.

Source of Definition: 29 CFR 1910.119:

> "~~Process means a~~Any activity involving a highly hazardous chemical including ~~any~~ use, storage, manufacturing, handling, or the on-site movement of such chemicals, or a combination~~s~~ of these activities. ~~For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.~~"

Discussion: Discussion regarding groups of vessels being considered a single process was deleted.

Process Manager (PM). A person, designated by the Contractor Representative, responsible for ensuring that the Process Steps are accomplished.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Process Management Team (PMT). A group of individuals designated by the Contractor Representative to approve specified actions proposed by the Process Manager and to monitor their implementation.

Source of Definition: None

Discussion: This glossary term was developed for TWRS Privatization.

Process Safety. The operation of facilities that handle, use, process, or store hazardous materials in a manner free of episodic or catastrophic incidents. However, the handling, use, processing, and storage of materials with inherent hazardous properties can never be done in the total absence of risk. Process safety is an ideal condition towards which one strives.

Source of Definition: AICHe Guidelines:

> ~~Process safety is t~~The operation of facilities that handle, use, process, or store hazardous materials in a manner free ~~from~~of episodic or catastrophic incidents. However, the handling, use, processing, and storage of materials with inherent hazardous properties can never be done in the total absence of risk. ~~In other words, p~~Process safety is an ideal condition towards which one strives.

Discussion: Changes to the definition were editorial only.

Process Safety Management. The application of management systems to the identification, understanding, and control of process hazards to prevent process-related injuries and incidents.

Source of Definition: AICHe Guidelines:

> ~~Process safety management is t~~The application of management systems to the identification, understanding, and control of process hazards to prevent process-related injuries and incidents.

Discussion: No changes were made to the source definition.

Public. Individuals who are not occupationally engaged at the Hanford Site.

Source of Definition: None

Discussion: Developed for TWRS Privatization due to a lack of consistent usage in standard references. For example, "Member of the Public" is defined in 10 CFR Parts 20 and 835, but application of the phrase is limited to exposure considerations related to normal operations, and exclusive of accident conditions.

Radiation Worker. A worker who has qualifications and training to work in a restricted area of the facility where radiation or radioactive material is present.

Source of Definition: None

~~"Radiological worker means a general employee whose job assignment involves operation of radiation producing devices or working with radioactive materials, or who is likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year total effective dose equivalent."~~

A worker who has qualifications and training to work in a restricted area of the facility where radiation or radioactive material is present.

Discussion: This definition was developed for TWRS privatization. A definition of "radiological worker" is provided in 10 CFR 835 which is based on potential doses. A new definition was desired to include all workers potentially exposed to radiation regardless of potential dose.

Regulatory Unit. The organization reporting to the Director of the Regulatory Unit dedicated to supporting the Director in executing regulatory authority.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization to facilitate specific reference to the regulatory authorities.

Reliability Targets. Quantified probabilistic expectations that a component, equipment, or system will perform its intended function satisfactorily under given circumstances, such as environmental conditions, limitations as to operation time, and frequency and thoroughness of maintenance for a specified period of time. Identified important to safety items are expected to perform their function satisfactorily through all design basis accident conditions.

Source of Definition: INSAG-3 (general principle)

Discussion: The generic expression "reliability target" was used in the INSAG-3 document. The definition identifies the expected characteristic of a reliability target and expresses the conditions to which the reliability target should relate.

Requirements. Standards that are mandated by an authority through statute, regulation, or contract.

Source of Definition: DNFSB/Tech-5

Discussion: Definition is based on DNFSB/Tech-5 definition of Safety Requirements which reads, "Enforceable mandates governing public health and safety."

Restricted Area. An area identified by the Contractor to which access is limited for the purposes of protecting individuals against undue risk from exposure to radiation and radioactive materials. Only a radiation worker is allowed into this area.

Source of Definition: 10 CFR 20.1003:

> "~~Restricted area means a~~An area~~,~~ identified by the Contractor~~access~~ to which access is limited ~~by the licensee~~ for the purpose of protecting individuals against undue risk~~s~~ from exposure to radiation and radioactive materials. Only a radiation worker is allowed in this area. ~~Restricted areas do not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.~~"

Discussion: This was tailored to TWRS Privatization.

Risk Analysis. The development of a qualitative or quantitative estimate of risk based on engineering evaluation and techniques for considering estimates of incident consequences and frequency.

Source of Definition: AICHe Guidelines:

> The development of a qualitative or quantitative estimate of risk based on engineering evaluation and techniques for considering estimates of incident consequences and frequenc~~ies~~y.

Discussion: This change was editorial.

Safe State. A situation in which the facility process has been rendered safe and no pressurized material flow occurs in the process lines. Any active, energy generating, process reactions are in controlled or passive equipment. The structures, systems, and components necessary to reach and maintain this condition are functioning in a stable manner, with all process parameters within normal safe state ranges.

Source of Definition: NPR:

> ~~Safe shutdown means a~~A situation in which~~: (1) the production reactor has been rendered subcritical; (2) the plant has the capability to remove decay heat at least as rapidly as it is being generated; and (3)~~ the facility process has been rendered safe and no pressurized material flow occurs in the process lines. Any active, energy generating, process reactions are in controlled or passive equipment. The structures, systems, and components necessary to reach and maintain ~~the first and second~~this condition~~s~~ are functioning in a stable manner, with all process parameters within normal safe ~~shutdown~~state ranges.

Discussion: Source definition is for the term "Safe Shutdown." The Reactor Safe Shutdown concept was modified to address process safety characteristics of the TWRS Privatized Contractor facilities.

Safety Analysis Report (SAR). A document that fully describes the analyzed safety basis for the facility (safety envelope), fully demonstrates that the facility will perform and will be operated such that radiological, nuclear, and process safety requirements are met, and fully demonstrates adequate protection of the public, the workers, and the environment.

Source of Definition: None

Discussion: This definition was developed for TWRS Privatization. Although a definition of this term is provided in DOE Orders 5480.22 and 5480.23, 10 CFR 830, NUREG-1513 (draft) and other sources, a definition was crafted from these traditional definitions to provide for consistency with the regulatory approach defined for TWRS Privatization. Specifically, it was necessary to address the emphasis on the contractors' responsibility for 1) achieving adequate safety, 2) complying with applicable laws and legal requirements, and 3) conforming with top-level safety standards and principles. Additionally, it was necessary to grant freedom to the contractors to formulate and tailor their safety documentation in a manner that best fulfilled their responsibilities.

Safety Assurance. Established confidence that adequate protection of worker and public health and safety has been provided.

Source of Definition: None

Discussion: This term was developed for TWRS Privatization.

Safety Basis. The combination of information relating to the control of hazards at a nuclear facility (including design, engineering analyses, and administrative controls) upon which the Director of the Regulatory Unit depends for its conclusion that activities at the facility can be conducted safely.

Source of Definition: DOE 5480.23:

> "~~Safety Basis means t~~The combination of information relating to the control of hazards at a nuclear facility (including design, engineering analys~~e~~~~is~~, and administrative controls) upon which the Director of the Regulatory Unit~~DOE~~ depends for its conclusion that activities at the facility can be conducted safely."

Discussion: A similar definition is provided in 10 CFR 830.

Safety Function. Any function that is necessary to ensure: 1) the integrity of the boundaries retaining the radioactive materials; 2) the capability to place and maintain the facility in a safe state; or 3) the capability to prevent or mitigate the consequences of facility conditions that could result in radiological exposures to the general public or workers in excess of appropriate limits.

Source of Definition: NPR:

> "~~Safety function means a~~Any function that is necessary to ensure: ~~(~~1) the integrity of the ~~reactor coolant or moderator pressure~~ boundaries retaining the radioactive materials;~~,~~ ~~(~~2) the capability to place~~shut down the reactor~~ and maintain the facility~~it~~ in a safe state;~~shutdown condition,~~ or ~~(~~3) the capability to prevent or mitigate the consequences of facility~~plant~~ conditions that could result in ~~core damage or in~~ radiological exposures to the general public or workers in excess of appropriate limits."

Discussion: Terms specific to nuclear reactors were removed.

Safety Limits. Limits on process variables associated with those physical barriers, generally passive, that are necessary for the intended facility safety functions and that are found to be required to prevent release of unacceptable levels of radioactive material to workers or the general public.

Source of Definition: DOE 5480.22 Section 9.e.(2):

> "~~Safety Limits are l~~Limits on process variables associated with those physical barriers, generally passive, that are necessary for the intended facility safety functions and that~~which~~ are found to be required to prevent~~guard against the uncontrolled~~ release of unacceptable levels of radioactive material to workers or the general public~~radioactivity and other hazardous materials (this includes releases into the complex and/or the community)~~."

Discussion: A similar definition is provided in 10 CFR 830.

Safety Requirements Document (SRD). A document that contains the approved and mandated set of radiological, nuclear, and process safety standards and requirements which, if implemented, provides adequate protection of workers, the public, and the environment against the hazards associated with the operation of the Contractor's facilities.

Source of Definition: None

Discussion: This term was developed for TWRS Privatization.

Safety Requirements Document Evaluation Report. The document approved and issued by the Director of the Regulatory Unit that addresses the adequacy of the set of radiological, nuclear, and process safety standards that a Contractor proposes to implement to ensure adequate protection of worker and public health and safety.

Source of Definition: None

Discussion: This term was developed for TWRS Privatization.

Safety Setpoints. Physical parameters set in the control equipment by an operator for equipment that controls the process or process flow to maintain the process within the systems design safety limits. A safety set-point represents a process characteristic, such as pressure, temperature, or material level, that is monitored by a control system to restrict the process characteristic within a system's design operating range. These set-points, identified in the design as levels above which a process physical parameter would exceed a design operating range of a process component or system leading to its failure and risk to the safety of the worker, public, or the environment. Several may be used to initiate alarm levels or control the process to a safe state.

Source of Definition: INSAG-3 (general principle)

Discussion: The term "setpoint" stems from the INSAG-3 principle "automatic safety system." The adjective "safety" was added to "setpoint" to more clearly discriminate it from a "trip-point."

Significantly New Safety Information. Either: 1) a safety requirement newly mandated by the Regulatory Unit; 2) a safety item newly identified by the Contractor as an item not included in the SAR for the facility; or 3) a determination that an unresolved safety question exists.

Source of Definition: None

Discussion: Developed for the TWRS Privatization regulatory process and for use in the TWRS top-level safety standards and principles as a project specific reference.

Stakeholder. Any individual other than Federal employees or DOE contractor employees that will be materially affected by, or can materially affect, the outcome of the work, either favorably or unfavorably.

Source of Definition: None

Discussion: This term was developed for TWRS Privatization.

Standards. The expressed expectation for the performance of work.

Source of Definition: DOE/EH/-0416

> "~~Standards are~~The expressed expectation~~s~~ for the performance of work."

Discussion: The changes are editorial only.

State-of-the-Art Human Factors. The most effective design approaches established for use at the start of the final design phase.

Source of Definition: NPR:

> "~~State-of-the-are human factors mean t~~The most effective design approaches established for use at the start of the final design phase ~~(Title II) of the contract~~."

Discussion:

Technical Safety Requirements. Those requirements that define the conditions, the safe boundaries, and the management or administrative controls necessary to ensure the safe operation of the facility, reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials, and from radiation exposures due to inadvertent criticality.

Source of Definition: DOE Order 5480.22(6)(p):

> "~~Technical Safety Requirements (TSRs) means t~~Those requirements that define the conditions, the safe boundaries, and the management or administrative controls necessary to ensure the safe operation of the~~a nuclear~~ facility, ~~and to~~ reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials, and~~or~~ from radiation exposures due to inadvertent criticality. ~~A TSR consists of safety limits, operating limits, surveillance requirements, administrative controls, use and application instructions, and the basis thereof. TSRs were formerly known as Operational Safety Requirements for nonreactor nuclear facilities and Technical Specification for reactor facilities.~~"

Discussion: A similar definition is provided in 10 CFR 830.

Unreviewed Safety Question (USQ). A safety question where any of the following conditions are satisfied: 1) the probability of occurrence or the radiological consequences of an accident or malfunction of equipment

important to safety, previously evaluated in the facility safety analyses may be increased; 2) a possibility for an accident or equipment malfunction of a different type than any evaluated previously in the facility safety analyses may be created; or 3) any margin of safety is reduced. (Also see definition for "Margin of Safety.")

Source of Definition: DOE Order 5480.22(6)(q):

> "~~A determination made by examining the following circumstances: (1) Temporary or permanent changes in the facility as described in existing safety analyses; (2) Temporary or permanent changes in the procedures as derived from existing safety analyses; and (3) Tests or experiments not described in existing safety analysis.~~
>
> ~~On identification of any of the above circumstances, an Unreviewed~~A ~~S~~safety ~~Q~~question where any~~exists if one or more~~ of the following conditions are satisfied~~result~~: ~~(~~1) ~~T~~the probability of occurrence or the radiological consequences of an accident or malfunction of equipment important to safety, ~~as~~ previously evaluated in the facility safety analyses may~~could~~ be increased; ~~(~~2) a~~The~~ possibility for an accident or equipment malfunction of a different type than any evaluated previously in the facility safety analyses may~~could~~ be created; and ~~(~~3) ~~A~~any margin of safety ~~as defined in the bases of the Technical Safety Requirements could be~~is reduced. (Also see definition for "Margin of Safety.")"

Discussion: The DOE Glossary contains a similar definition to that in DOE 5480.22. The NPR definition is almost identical to the J-document definition.

Work. Functional description of a set of activities (e.g., process operations) that will produce the intended outcome or objective (such as achieving a mission in terms of specified functional requirements).

Source of Definition: None

Discussion: Developed for TWRS Privatization.

Worker. Worker means an individual within the controlled area of the facility performing work for or in conjunction with the Contractor or utilizing Contractor facilities.

Source of Definition: 10 CFR 835:

> "Worker~~General employee~~ means an individual within the controlled area of the facility~~who is either a DOE or DOE contractor employee; an employee of a subcontractor to a DOE contractor; or a visitor who~~ performing~~s~~ work for or in conjunction with the Contractor~~DOE~~ or utilizing~~es~~ Contractor~~DOE~~ facilities."

Discussion: The DOE Radiological Control Manual also defines this under "General Employee."

Work Activities. All activities associated with performing the work, including design, construction, operation, and deactivation.

Source of Definition: None

Discussion: The term was developed for TWRS Privatization.

Work Activity Experts. Individuals with knowledge and expertise relevant to the work, site, and activities addressed by the standards set.

Source of Definition: None

Discussion: The term was developed for TWRS Privatization.

APPENDIX C: CONTRIBUTORS TO THIS DOCUMENT

Contributor	Organization	Relevant Section(s)
James E. Adams	RU	All Sections and Appendices
Robert Barr	RU	Appendix A
Rey Bocanegra	RU	Appendices A and B
Dr. Jay Boudreau	BLE, Inc.	Section 2.0
Dr. Jeff MartinLANL		Section 2.0, Appendices A and B
Steven E. Merwin	Dade Moeller & Associates	All Sections and Appendices
Lewis F. Miller	RU	All Sections and Appendices
Matthew P. Moeller	Dade Moeller & Associates	Appendices A and B
Robert Smoter	PNNL	Appendix A