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DOE-STD-3011-94
November 1994

DOE STANDARD

GUIDANCE FOR PREPARATION OF BASIS FOR INTERIM OPERATION (BIO) DOCUMENTS

U.S. Department of Energy
Washington, D.C. 20585

AREA SAFT

FOREWORD

1. This Department of Energy (DOE) Standard (STD) has been approved for use by the DOE Office of Nuclear and Facility Safety Policy and is available for use by all DOE elements, including the National Nuclear Security Administration (NNSA), and its contractors. Throughout this document, whenever it references a contractor or a DOE contractor, the statement applies to a contractor for NNSA as well.

2. Beneficial comments (e.g., recommendations, additions, and deletions) and any pertinent data that may improve this document should be sent to: Richard M. Stark, Office of Nuclear and Facility Safety Policy, EH-53/270/GTN, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874; Phone (301) 903-4407; Facsimile (301) 903-6172; Email: Richard.Stark@eh.doe.gov.

3. Appendix A of Title 10 of the Code of Federal Regulations (CFR) Part 830, Nuclear Safety Management, Subpart B, Safety Basis Requirements, states that the contractor responsible for (1) a DOE nuclear facility with a limited operational life, (2) the deactivation of a DOE nuclear facility, or (3) the transition surveillance and maintenance of a DOE nuclear facility may prepare its documented safety analysis (DSA) using the methodology in this Standard.

4. This Standard provides guidance for the development of Basis for Interim Operation (BIO) documents, which are an acceptable form of DSA under the provision of the 10 CFR 830 Rule. In this regard, it supplements the guidance in DOE Guide (G) 421.1-2, Implementation Guide for Developing Documented Safety Analyses to Meet Subpart B of 10 CFR Part 830.

5. This Standard does not establish or invoke any new requirements.

6. References to documents (e.g., rules, DOE orders, and standards) refer to the current version.

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1. INTRODUCTION

1.1 Scope. This Standard provides a Department of Energy (DOE) approved methodology for preparing a Basis for Interim Operation (BIO) document. The BIO is an acceptable form of Documented Safety Analysis (DSA) in accordance with Table 2 of Appendix A, *General Statement of Safety Policy*, to Title 10 of the Code of Federal Regulations (CFR) Part 830, *Nuclear Safety Management*, Subpart B, *Safety Basis Requirements* (hereafter, in this Standard referred to as the "Rule"). It supplements the information in DOE Guide (G) 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*.

Contractors with facilities having existing DOE-approved BIOs may wish to continue operations under those BIOs. In evaluating the viability of this approach, contractors must assess whether or not those BIOs reflect the current facility status and operations and whether the guidance of DOE-STD-3011-94, *Guidance for Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans*, was followed in their development. In doing so, contractors should consider the following:

- Item 5 of the Forward of DOE-STD-3011-94 has the statement: "It is noted that, in any event, the Rules will govern." This referred to the planned (at that time) Rule safety basis requirements as related to Order requirements. In other words, a BIO prepared in accordance with DOE-STD-3011-94 must also comply with the Rule requirements. The Standard is consistent with DOE Order 5480.23, and the Rule is consistent with the Order in the scope of requirements.
- Paragraphs 3 and 4 of section 4.2.1 of DOE-STD-3011-94 provide the guidance that if an upgrade of a Safety Analysis Report to full compliance with DOE Order 5480.23 (read, now, the Rule) is not warranted, then an exemption from the requirements is the route to take. It follows that, if the existing BIO is not fully compliant with DOE-STD-3011-94 and a contractor chooses not to upgrade it to current Rule requirements, then a Rule exemption should be prepared and submitted.
- It is clear from the guidance of DOE-STD-3011-94 that worker safety must be addressed in a BIO (see Section 4.2.4.2 and sections A.2 and A.4. In addition, Integrated Safety Management Systems must include provisions for worker safety at the facility level (as well as the site and task levels). At the facility level this is done as part of the safety basis (BIO and TSR). Many existing BIOs are based on decades old bounding accidents and do not reflect consideration of work processes that is necessary for assurance of worker safety. If a BIO does not treat worker safety by hazard analysis and identification of appropriate safety controls, then it is not compliant with either the Rule or DOE-STD-3011-94.
- DOE-STD-3011 is a safe harbor for the DSA requirements of 10 CFR 830. TSR requirements of the Rule must separately be satisfied. Under DOE-STD-3011-94, safety controls were integral to the BIO. The ability of the BIO to support development of a Rule-compliant TSR document should be assessed.
- A BIO developed under the nuclear safety Order DOE 5480.23 was a bridge between safety documentation that existed prior to the Order and a fully Order-

compliant Safety Analysis Report. It was not expected to be fully compliant with the Order. However, a BIO under 10 CFR 830 must fully satisfy the requirements of 10 CFR 830 parts .202 and .204.

- Specifically, the DSA (BIO) must include:
- Facility categorization according to DOE-STD-1027
- A description of the facility (including the work to be performed)
- A systematic identification of hazards associated with the facility
- Evaluation of normal, abnormal, and accident conditions (including potential natural phenomenon hazards that might be associated with long term status) that might be associated with the generation or release of radioactive or other hazardous materials, including consideration of the need for analysis of beyond design basis accidents
- Derivation and classification of hazard controls necessary to protect workers, the public, and the environment
- Definition of the characteristics of safety management programs necessary to ensure safe operation, including criticality safety, when criticality hazards exist

1.2 Applicability. DSAs are required for Hazard Category 1, 2, or 3 nuclear facilities as defined in 10 CFR 830 and formalized in DOE-STD-1027, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE 5480.23*. Facilities and operations that fall below the Hazard Category 3 threshold are considered outside the scope of 10 CFR 830 requirements for a DOE-approved DSA. The methodology in this Standard has been determined to be acceptable for the following types of DOE-owned or DOE-leased (including National Nuclear Security Administration [NNSA]) Hazard Category 1, 2, and 3 nuclear facilities and activities:

a. A nuclear facility with a limited operational life;
b. The deactivation of a nuclear facility; and
c. The transition surveillance and maintenance of a nuclear facility.

The terms “nuclear facility with a limited operational life”, “deactivation”, and “transition surveillance and maintenance activities” are defined in Table 3 of Appendix A of 10 CFR 830 Subpart B and are further expanded upon in Section V.2.4, Basis for Interim Operations for Deactivation, Surveillance and Maintenance, and Limited Operational Life Facilities, of DOE Guide 421.1-2. In the context of this Standard, these activities are interpreted to be interim operations, since the expected normal lifetime for these activities is ideally anticipated to be the short (i.e., less than 5 years for limited operational life) interim transitional periods immediately prior to, during, or after deactivation. While this standard allows for an abbreviated and graded approach to development of a safety basis, the expectation exists that the completeness of the analysis will be sufficient so that even though a limited operational life is envisioned, significant hazards will be identified and appropriate controls implemented accordingly. It is also important to recognize and anticipate that the ideal may not be realized. That is, especially in the case of transition surveillance and maintenance, the time interval that a facility may be in that mode may extend many years beyond “short.” When this may be the case, special attention

must be paid to hazards that may develop over the extended period of time. For example, the importance of consideration of natural phenomenon hazards is increased as the time spent in a particular mode (limited operational life, transitions surveillance and maintenance, or deactivation) is extended.

1.3 Background. All of the guidance in the previous version of this Standard, pertaining to implementation plans, has been deleted since the 10 CFR 830 Rule does not require an implementation plan. The methodology in the previous version of this Standard for development of BIOs has been updated to assure compliance with the Rule and its associated Implementation Guides.

As its name implies, the BIO establishes for the types of interim operations described in the preceding section, the interim safety basis for the facility. The contractor must also develop a Technical Safety Requirements (TSRs) document as part of the safety basis to satisfy the requirements of 10 CFR 830.205, *Technical safety requirements*. An existing DSA for operational activities, a Safety Analysis Report (SAR), or an Operational Safety Requirements (OSR) document may be helpful supporting documentation to the degree that they are current and correct. Due to the wide variety of facilities and activities within the DOE complex, and the broad spectrum of existing safety documentation among the facilities, it is expected that the contents of the BIOs and the efforts required to prepare them will vary.

1.4 Alternative Methodology or Significant Deviations. In accordance with 10 CFR 830 DSAs for these types of interim operations may also be prepared utilizing the safe harbor methodology in DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*.

If a contractor uses a method other than a safe harbor method, it must obtain DOE approval of the method before developing the DSA. Likewise, if a contractor uses a safe harbor method to develop the DSA, but does not follow the method completely, the contractor should request DOE approval of the method with the specific deviations noted. The use of alternative methods or specific deviations from the safe harbor methods must have (1) for NNSA facilities the approval of the Deputy Administrator or for non-NNSA facilities, the approval of the Cognizant Secretarial Officer (CSO) as specified in paragraph 9.3.1 of DOE Manual 411.1-1B, *Safety Management Functions, Responsibilities, and Authorities Manual (FRAM)*, and (2) the review and concurrence (or comment if an NNSA facility is involved) of the DOE Headquarters Office of Environment, Safety, and Health (DOE HQ / EH) as specified in paragraph 9.4.1.6 of the FRAM. Generally, in order to approve an alternative methodology, the DOE responsible organizations would need to find that the alternative methodology was sufficiently rigorous to provide an equivalent level of safety in the alternative DSA and resulting controls. Refer to Section 5 of DOE G 421.1-2 for additional guidance.

2. ACRONYMS

The following are key terms used in this Standard:

a.	BIO	-	Basis for Interim Operation
b.	CFR	-	Code of Federal Regulations
c.	CSO	-	Cognizant Secretarial Officer
d.	DNFSB	-	Defense Nuclear Facilities Safety Board
e.	DOE	-	Department of Energy
f.	DSA	-	Documented Safety Analysis
g.	EH	-	Office of Environment, Safety, and Health
h.	EIS	-	Environmental Impact Statement
i.	FHA	-	Fire Hazards Analysis
j	FRAM	-	Functions, Responsibilities, and Authorities Manual
k.	G	-	Guide
l.	GTN	-	Germantown
m.	HASP	-	Health and Safety Plan
n.	HAZOP	-	Hazards and Operability Study
o.	HQ	-	Headquarters
p.	NNSA	-	National Nuclear Security Administration
q.	OSR	-	Operational Safety Requirement
r.	PrHA	-	Process Hazards Analysis
s.	SAR	-	Safety Analysis Report
t.	SSC	-	Structures, Systems, and Components
u.	STD	-	Standard
v.	TECH	-	Technical Report
w.	TSR	-	Technical Safety Requirement

3. BIO FOR NUCLEAR FACILITY WITH LIMITED OPERATIONAL LIFE

A nuclear facility with a limited operational life is a nuclear facility for which there is a short remaining operational period before ending the facility's mission. Following this there would be periods of surveillance and maintenance, deactivation, and decommissioning. DOE G 421.1-2 defines a limited life facility as a facility with an approved deactivation plan calling for cessation of operation within a stated period (i.e., 5 years or less). The deactivation plan should include required funding action and plan change control to ensure relevancy.

The primary rationale for utilizing the BIO approach is that the short (i.e., normally less than 5 years) remaining operational life of the facility does not justify the increased time and cost required to develop a DSA fully utilizing the DOE-STD-3009 methodology.

Existing information (e.g., current SAR, and supporting documentation) should be reviewed against the listing above. Maximum advantage should be taken of pertinent existing safety analyses and design information (i.e., requirements and their bases) that are immediately available, or can be retrieved through reasonable efforts. Other information arises from existing sources such as process hazards analyses (PrHAs), fire hazards analyses (FHAs),

explosive safety analyses, health and safety plans (HASPs), environmental impact statements (EISs), etc. When existing information is not current and correct, cannot be verified, or does not exist, the existing information must be supplemented.

The approach taken to supplement existing information should be pragmatic. It should be consistent with the limited lifetime expectancy of the facility, so time consuming approaches should be avoided whenever possible. Analyses should generally be qualitative, but thorough. When adequate information is not available to fully support the DSA, conservative compensatory approaches to assuring adequate safety should be considered and, if adopted, the rationale for safety adequacy should be presented. The maximum use of the graded approach philosophy, consistent with a responsible fulfillment of the Rule requirements should be used.

The format, content, and guidance of DOE-STD-3009, chapters 2 through 6 should be used to organize the existing information and when existing information must be supplemented, to the following extent (i.e., it is not expected that the full formatting down to the lowest subsection descriptions in DOE-STD-3009 must be used).

Facility description should be in a BIO chapter 2; hazard and accident analysis guidance in chapter 3 of DOE-STD-3009 should be used when existing information must be supplemented, and the results described in a BIO chapter 3, etc. Generally, thorough qualitative hazards analyses should be expected. Under the Graded Approach subsection of this format, a short description of the graded approach taken for the section and its rationale should be presented.

Consistent with the Rule, hazard controls identified in hazards analysis that are safety structures, systems, and components (safety SSCs) should be evaluated for classification as safety class or safety significant SSCs according to the definition of those terms in the Rule and the guidance in DOE-STD-3009. They should be described in a BIO chapter 4. Existing information should be used to the maximum extent possible, supplemented where necessary. The Rule (10 CFR 830.205) requires Technical Safety Requirements. These are derived from the DSA (BIO). Information useful to link the BIO to the TSR document, such as the bases of safety limits, etc., a listing of TSR design features and their rationales, and the bases for safety management programs should be presented in a BIO chapter 5. As with Category 3 DSAs, the basis for safety management programs, and any facility-specific characteristics of them that are necessary, is derived through hazards analyses. A listing of these programs, with references to sitewide programs and the facility-specific characteristics should be presented in summary table form.

If criticality hazards exist, a criticality safety program must be addressed in a BIO chapter 6. The description should show how the program:

- Ensures that operations with fissionable material remains subcritical under all normal and credible abnormal conditions,
- Identifies applicable nuclear criticality standards, and
- Describes how the program meets applicable nuclear criticality standards.

The guidance of DOE-STD-3009 for criticality safety, including its chapter 6, should be followed.

Alternatively to the formatting guidance in the preceding paragraphs, when a BIO exists for the facility already, the format of a BIO described in section A.7 of Appendix A of DOE-STD-3011-94 may be retained, with a crosswalk to the DOE-STD-3009 format and content.

4. BIO FOR DEACTIVATION OF A NUCLEAR FACILITY

Deactivation refers to the process of placing the facility in a stable and known condition and the removal of readily removable hazardous and radioactive materials. Deactivation activities include the removal of energy sources, draining and/or de-energizing nonessential systems, removal of stored radioactive and hazardous materials, and related actions.

Deactivation should be a short-term process, measured in months, or at most a very few years. In this sense it is comparable to a facility with limited operational life. However, the deactivation mission is not a continuation of a production function; instead, the mission is to remove hazardous material to decrease risk during extended surveillance and maintenance or decontamination and decommissioning. The BIO approach to developing a DSA for these activities is designed to provide a time and cost effective means of satisfying the DSA requirements of 10 CFR 830.

Hazardous material information reflecting the end of facility operations can support a preliminary categorization, which would normally be the same as was assigned during facility operations, and is necessary in any case for the planning process for deactivation.

Facility description can also be taken from existing information. However, the work to be performed is new. Before BIO content beyond preliminary categorization and facility description can be developed, a plan that describes the steps, and how they will be accomplished, must be formulated. DOE O 430.1A requires an end-point process for detailed engineering planning and plan documentation to be used to identify the preferred alternative for deactivation and/or decommissioning, should be the primary source for the description of the deactivation plan. DOE G 430.1-3, Deactivation Implementation Guide, and the website http://www.em.doe.gov/deact, contain further guidance on plan development. Development of the safety basis for deactivation should be closely coordinated during the development of the plan. As described in the BIO, this plan defines the work to be performed. It must be in sufficient detail that the hazards associated with the deactivation process can be identified, an evaluation of normal, abnormal, and accident conditions performed, and hazard controls identified and classified.

The plan should show remaining hazardous material inventory as a function of steps in the plan. Depending on the extent of material removal during the process of deactivation, the facility may fall below the category 3 nuclear facility threshold during deactivation. That point should be identified and provisions made for verification, because Subpart B

requirements of the Rule would no longer apply; the appropriate contractual provisions for a radiological facility would need to be implemented.

Identification of hazards, evaluation of normal, abnormal, and accident conditions, and derivation of hazard controls will be a function of the step in the plan. If the steps were to be conducted sequentially the process would be straightforward. However, if steps are conducted in parallel, then the possibility of interactions between concurrent steps must also be considered. The simplest hazard analysis technique that is consistent with the magnitude and complexity of the process step and its associated hazards should be used (preliminary hazard analysis, what-if analysis, Hazards and Operability Study [HAZOP], etc.).

The identification and classification of hazard controls will also be a function of step in the plan. Usually facility safety SSCs will all be appropriate controls at the beginning of the deactivation process. However, as hazardous materials are removed, the accident scenarios for which they were originally designed for prevention or mitigation may no longer be possible, and the controls may be removed. The plan, supported by a hazard analysis, should provide identification of when in the deactivation steps existing controls may be removed (and when other controls may be necessary) and the criteria that must be satisfied before they are removed. In this way, once DOE approves the BIO, with the criteria that must be satisfied, further DOE DSA reviews and approvals, other than verification that the criteria have been met, are not required.

The format of presentation of BIO material may be different than that in a DOE-STD-3009 DSA. For example, it may add clarity if, beyond facility description and deactivation plan description in a BIO chapter 2, the balance of DSA information is organized by major step, or activity, in the deactivation plan. That is, for each major activity, the hazards are identified and analyzed, and hazard controls, including safety management programs are described and classified. Association with a timeline or schedule may be useful.

The Rule (10 CFR 830.205) requires Technical Safety Requirements. These are derived from the DSA (BIO). A TSR may be constructed as a function of major step in the deactivation plan. That is, each major step can be defined as an operational mode, and the controls specified appropriate to each mode. As with Category 3 DSAs, the basis for safety management programs, and any facility-specific characteristics of them that are necessary, is through hazards analyses. A listing of these programs, with references to site-wide programs and the facility-specific characteristics should be presented in summary table form.

5. BIO FOR TRANSITION SURVEILLANCE AND MAINTENANCE OF A NUCLEAR FACILITY

Transition surveillance and maintenance means activities conducted when a facility is not operating and not during deactivation, decontamination, and decommissioning activities. Ideally, deactivation would precede transition surveillance and maintenance, but often it does not. That is, mission related operations may have been terminated and the facility placed into a surveillance and maintenance mode, possibly with the expectation of resuming operations at a later date, without removal of hazardous materials. During this phase surveillance and

maintenance are the primary activities being conducted at the facility. These activities are necessary for satisfactory containment of hazardous materials and protection of workers, the public, and the environment. Surveillance and maintenance activities include providing periodic inspections and maintenance of structures, systems, and equipment necessary for the satisfactory containment of contamination and for protection of workers, the public, and the environment. Maintenance of the facility in a stable and known condition includes actions to prevent the alteration in chemical makeup (e.g., chemical changes in material in storage tanks leading to the creation of explosive mixtures), physical state, and/or configuration of a hazardous substance or radioactive material. It also includes actions taken with regard to physical SSCs (e.g., roofs, ventilation).

A DOE nuclear facility scheduled for transition surveillance and maintenance should generally have some type of existing safety basis documentation, which covers the present activities. This can range from very limited safety basis documentation to a DOE-approved DSA. The BIO for transition surveillance and maintenance of a nuclear facility should make maximum use of pertinent existing safety basis documentation for the facility. However, the SAR (or DSA) that existed for the normal operational mission of the facility is not appropriate for transition surveillance and maintenance because the safety concerns will be different.

The BIO for transition surveillance and maintenance of a nuclear facility should include consideration of (1) hazards associated with the facility that exist because of the presence of hazardous materials (e.g. storage of radioactive material); (2) hazards associated with the conduct of surveillance and maintenance activities; (3) hazards associated with the alteration in chemical makeup, physical state, and/or configuration of a hazardous substance or radioactive material or the degradation of the physical state of the facility and its equipment over time and; (4) natural phenomena hazards and their impact on the remaining life of the facility. Particular attention should be paid to the potential long period of time that the facility may remain in this mode of operation.

While it is true that DOE desires to expedite the ultimate disposition of excess facilities, limitations of available resources can lead to extended periods of transitional surveillance and maintenance, sometimes without deactivation having been accomplished. The issues of potential alteration of chemical makeup, physical state, and or configuration of a hazardous substance or radioactive material, or the degradation of the physical state of the facility and its equipment over time, including safety SSCs, should be given special attention when this may be the case.

DOE G 430.1-2, Implementation Guide for Surveillance and Maintenance during Facility Transition and Disposition, provides guidance for the development of a Surveillance and Maintenance Plan. The development of this Plan and the development of the safety basis for the facility during transition surveillance and maintenance should be coordinated activities.

The format of DOE-STD-3009, chapters 2 through 6, should be used to organize the information to the following extent (i.e., it is not expected that the full formatting down to the lowest subsection descriptions in DOE-STD-3009 must be used).

Facility description should be in a BIO chapter 2; hazard and accident analysis guidance in chapter 3 of DOE-STD-3009 should be used and the results described in a BIO chapter 3, etc. Generally, qualitative hazards analyses should be expected.

Consistent with the Rule, hazard controls identified in hazards analysis that are safety structures, systems, and components (safety SSCs) should be evaluated for classification as safety class or safety significant SSCs according to the definition of those terms in the Rule and the guidance in DOE-STD-3009. They should be described in a BIO chapter 4, to the extent that existing information can support.

The Rule (10 CFR 830.205) requires Technical Safety Requirements. These are derived from the DSA (BIO). Information useful to link the BIO to the TSR document, such as the bases of safety limits, etc., a listing of TSR design features and their rationales, and the bases for safety management programs should be presented in a BIO chapter 5. As with Category 3 DSAs, the basis for safety management programs, and any facility-specific characteristics of them that are necessary, is through hazards analyses. A listing of these programs, with references to site-wide programs and the facility-specific characteristics should be presented in summary table form.

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CONCLUDING MATERIAL

Review Activity:

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Preparing Activity:

DOE-EH-53

Project Number:

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