



DOE-STD-3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*

**Changes to DOE-STD-3009 and
Expectations for Effective Implementation**



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Objectives

- Understand the history and drivers for changes in STD-3009
- Understand the major differences between STD-3009-94 (CN-3) and STD-3009-2014
- Understand key requirements of STD-3009-2014 and DOE expectations for effective implementation





Agenda

- **Session 1 – Introduction**
- **Session 2 – Hazard Analysis**
- **Session 3 – Accident Analysis**
- **Session 4 – Hazard Controls Selection**





History of DOE-STD-3009-94

- **DOE-STD-3009-94 – Issued July 1994**
- **DOE-STD-3009-94, CN 1 – Issued January 2000;
Adds Appendix A, Evaluation Guidelines;
Safe Harbor in 10 C.F.R. 830 (Issued January 2001)**
- **DOE-STD-3009-94, CN 2 – Issued April 2002;
Incorporates terminology used in and references to
10 C.F.R. 830, replacing refs. to 5480.21, .22, and .23**
- **DOE-STD-3009-94, CN 3 – Issued March 2006;
Incorporates Specific Administrative Controls**





DOE-STD-3009-94, CN 1 - 10 C.F.R. 830 Safe Harbor Methods

Reactor (HC-1)	US NRC Reg. Guide 1.70, Standard Format and Content of SARs for Nuclear Power Plants
Nonreactor Nuclear Facility (HC-2)	STD-3009 CN 1, "or successor document"
Limited Life Facility & Deactivating Facility	STD-3009 , <u>or</u> STD-3011, Basis for Interim Operations
Environ. Restoration & Decommissioning Activity	STD-1120, Integration of ESH into Facility Disposition Activities, <u>and</u> 29 CFR 1920.120, OSH Standards
Nuclear Explosives Facility	STD-3009 , for facility & general operations, <u>and</u> STD-3016, for specific nuclear explosives operations
Transportation Activities	DOE O 460.1 <u>and</u> G 460.1-1, or DOE O 461.1 <u>and</u> M 461.1-1 for nuclear explosives
HC-3 Nuclear Facility	STD-3009 , Chapters 2, 3, 4, & 5

Source: 10 C.F.R. 830, Subpart B, Appendix A, Table 2





Drivers of Recent Changes

- Experience and Lessons Learned from 20 years of use of DOE-STD-3009-94
- DOE-STD-1189-2008, *Integration of Safety into the Design Process*
- DOE O 420.1C, *Facility Safety* (12/4/2012)
- DOE STD-1020-2012, *NPH Analysis and Design Criteria for DOE Facilities*
- DOE-STD-1628-2013, *Development of Probabilistic Risk Assessments for Nuclear Applications*





Drivers of Recent Changes (cont.)

- **DNFSB Recommendation 2010-1, Issued October 2010**
 - *Affirm requirement to prevent or mitigate postulated accident consequences to **below the EG (25 rem)**; Take actions for existing DOE facilities to meet this requirement.*
 - ***Revise DOE-STD-3009-94 to identify clear and unambiguous requirements.***
 - *Revise **10 C.F.R. 830** to incorporate revised DOE-STD-3009 as a requirement, not a safe harbor.*
 - *Revise **DOE-STD-1104** to formally establish requirements for DOE federal review of DSAs.*
 - *Identify **DOE oversight process** for effective implementation of revised DOE-STD-1104.*





Drivers of Recent Changes (Cont.)

■ Secretary of Energy Response (February and May 2011)

SOE rejected three sub-recommendations:

- *Firm commitment to revise 10 C.F.R. 830; SOE agreed to “evaluate” changes to 10 C.F.R. 830*
- *Firm commitment to criteria for SSC mitigation to “a fraction of the EG;” SOE agreed to “consider”*
- *Specific DOE-STD-1104 criteria for risk acceptance for existing facilities with estimated doses over the EG; SOE agreed to clearly identify requirements in 3009 and 1104 for such situations*





Drivers of Recent Changes (Cont.)

■ DOE IP 2010-1, Regulatory Options Paper (Sect. 6.5)

SOE Decisions (10/18/2014 Letter, Moniz to Winokur):

- *No Changes to 10 C.F.R. 830,*
- *Invoke revised DOE-STD-1104 as required method in DOE O 420.1C,*
- *Apply revised DOE-STD-3009-2014 via change to DOE O 420.1C to:*
 - (1) new facilities,*
 - (2) major modifications to existing facilities, and*
 - (3) existing facilities with mitigated dose estimates over the EG*





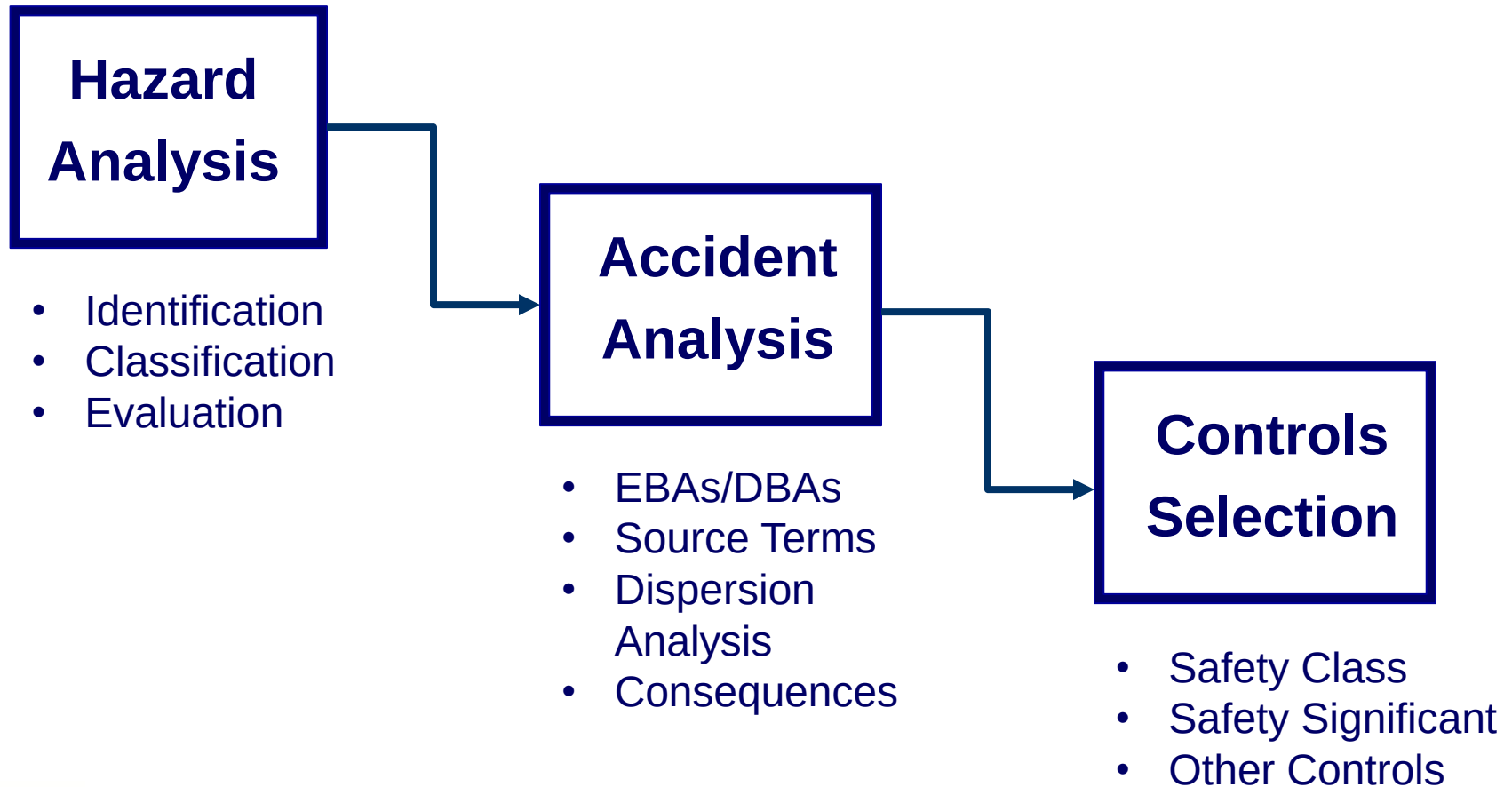
History of DOE-STD-3009-2014

- DNFSB Recommendation received October 2010
- Draft STD workshops in January, March, June 2011
- DOE 2010-1 IP approved September 26, 2011
- Identify STD “Improvement Areas” in January 2012
- Draft STD to RevCom review in January 2013
- Draft STD to Response negotiation in October 2013
- Draft STD to Concurrence in March 2014
- Draft STD back to Concurrence in September 2014
- DOE-STD-3009-2014 issued November 12, 2014





Overview of DSA Process





Classification of Hazard Controls

CLASSIFICATION	PURPOSE
Safety-Class	• Protect Public from significant Radiological Consequences
Safety-Significant	• Major Contributors to Defense-in-Depth • Protect Public from significant Chemical Consequences • Protect Co-located Workers • Protect Facility Workers
Other Controls	• Provide adequate protection from hazards to workers, public, or environment



DOE-STD-3009-2014

Major Changes

NEW

- Clarifies use of the Evaluation Guideline,
- Establishes Evaluation Requirements if over the EG,
- Clarifies use of bounding parameters,
- Clarifies methods for unmitigated and mitigated hazard evaluations,
- Clarifies treatment of standard industrial hazards,
- Clarifies chemical hazards screening or further hazard evaluation,
- Establishes a clear criterion for hierarchy of controls and requires documentation of the rationale,

NEW





DOE-STD-3009-2014

Major Changes (Cont.)

- Clarifies major contributors to defense-in-depth for selection of safety significant controls,
-  ■ Incorporates methodologies for co-located workers and chemical hazard evaluations,
- Refines methods for air dispersion calculations,
-  ■ Provides specific criteria for determining the functional adequacy of safety SSCs,
-  ■ Changes threshold for criticality safety controls in the DSA, and
-  ■ Reduces the level of description required in DSAs for safety management programs.





DOE-STD-3009-2014

Exemptions and Equivalencies

- DOE-STD-3009-2014 – Implement “in its entirety” to meet 10 C.F.R. 830 requirements
 - “All applicable ‘shall’ statements are met”
- DOE-STD-1083-2009, *Processing Exemptions to Nuclear Safety Rules and Approval of Alternative Methods for DSAs*
- O 251.1C exemptions and equivalencies not applicable to DOE-STD-3009-2014





DOE-STD-3009-2014

Structure of the Standard

- 1. Introduction**
- 2. Preparation Process & Graded Approach**
- 3. Hazard Analysis, Accident Analysis, & Selection of Hazard Controls**
- 4. DSA Format and Content**
 - A. Background: Key DSA Concepts**
 - B. Transition for STD-1189 Facilities**





DOE-STD-3009-2014

Appendix A – Key DSA Concepts

- A1. Standard Industrial Hazards**
- A2. Chemical Hazards**
- A3. Initial Conditions**
- A4. Hazard Evaluation and Risk Ranking**
- A5. Criticality Safety**
- A6. Evaluation Basis Accidents**
- A7. Dispersion Modeling Protocol**
- A8. Hierarchy of Controls**
- A9. Defense-in-Depth**
- A10. Evaluation Guideline**
- A11. Safety Management Programs**
- A12. Specific Administrative Controls**





DOE-STD-3009-2014

Implementation Expectations

Must apply:

- (1) New DOE Nuclear Facilities,
- (2) Major Mods. to Existing Facilities, and
- (3) Existing Facilities over the EG.

Other facilities should apply over time.

- Perform Gap Analysis
- Identify Costs and Benefits
- Pace out transitions over 5+ years
- Do not upgrade if limited life activity
- Consider DSA upgrades to 3009-2014 when doing major modifications





DOE-STD-3009-2014

Implementation Expectations

New DOE Nuclear Facilities – Ongoing projects (for new facilities and major mods.) may use pre-approved exemption from applying DOE-STD-3009-2014 if they have achieved design maturity – see DOE O 420.1C, page change 1, section 3.c.(9).

Major Modifications to Existing Facilities – Major modifications (as defined by 10 CFR 830 and DOE-STD-1189) may take “off-ramp” from applying DOE-STD-3009-2014 if approved by the appropriate Secretarial Officer, with concurrence by the applicable CTA – see DOE O 420.1C, page change 1, section 4.g.





DOE-STD-3009-2014

Implementation Expectations

Main Benefits of Applying new STD-3009-2014

- Clear requirements; Easier to defend safety basis
- Reflects Lessons Learned and good practices
- Integrates with current DOE directives and standards
- Provides added assurance that set of safety-significant controls is sound
- Reduced DSA documentation/annual maintenance requirements for important safety management programs and criticality safety program
- Eliminates inconsistencies of applying different versions of STD-3009 to different facilities
- This is the way of the future (e.g., STD-1189 revision)





Status of Existing DOE-STD-3009-94

- **Not cancelled with issuance of DOE-STD-3009-2014**
- **May still be used for existing facilities, provided (1) mitigated offsite doses estimates not over the EG, and (2) no major modifications**
- **If major modifications to existing facilities, PSO, with concurrence of CTA, may approve continued use of STD-3009-94 for the DSA revision**
- **Current AU-31 plan is to maintain STD-3009-94 if future changes are needed**





“Evaluation” of Existing Facilities

(Evaluation protocol not yet finalized)

Scope of Evaluations

- **Committed by SOE in 2010-1 IP; commitment reiterated by Sec. Moniz in 10/18/2014 letter**
- **Purpose: Provide added assurance for SC controls**
- **Focus on significant changes to STD-3009 requirements related to SC controls**
- **Evaluate by inspection, analysis, or other means**
- **Identify any gaps and recommended enhancements**
- **DOE Field Offices to perform evaluations and make decisions on safety basis and facility enhancements**





“Evaluation” of Existing Facilities

(Evaluation protocol not yet finalized)

SOE Commitment (10/18/2014 Letter, Moniz to Winokur):

“In addition, as stated in Section 6.2 of the Department's 2010-1 IP, the evaluation of DSAs for existing defense nuclear facilities relative to the new revision of DOE-STD-3009 will be performed consistent with the current regulatory process for developing and maintaining DSA updates. This evaluation will look for and implement enhancements that can be made based upon lessons learned and best practices that have been incorporated in the revised DOE-STD-3009, related to protection of the public from nuclear hazards. The Department is in the process of developing its approach for this evaluation.”





“Evaluation” of Existing Facilities

(Evaluation protocol not yet finalized)

Facilities to be Evaluated (if these criteria are met)

- **Defense Nuclear Facilities (including new facilities in design/construction phase with mature designs)**
- **Use STD-3009 as DSA safe harbor**
- **HC-2 Facilities (others don’t need SC controls)**
- **Unmitigated offsite dose (using 3009-2014 assumptions and methods) greater than 5 rem**
- **Mitigated offsite dose less than EG
(if over the EG, must apply new STD-3009)**
- **Expected operational lifetime greater than 3 years.**





“Evaluation” of Existing Facilities

(Evaluation protocol not yet finalized)

Significant Changes to be Evaluated (DRAFT)

- **Mitigated consequences below the EG**
- **Default values used for Source term calculations or adequate technical basis is provided**
- **Dispersion modeling methods/assumptions adequate**
- **Representative, recent met. data for five years**
- **Use of 99.5th percentile if directional dependent distribution is used**
- **Technical basis provided when the hierarchy of controls is not followed for SC controls**





“Evaluation” of Existing Facilities

(Evaluation protocol not yet finalized)

Schedule and Documentation (DRAFT)

- **Start after Evaluation Protocol issued**
- **Evaluation complete with report submitted, and any proposed safety basis changes identified no later than July 2016**
- **Approval by SBAA by Sept. 2016**
- **If updates to DSA are needed, perform as part of annual DSA update**





DOE-STD-3009-2014

Introduction Summary

- **STD-3009 is the key safe harbor to meet 10 C.F.R. 830**
- **The revised STD-3009 provides clarified requirements for preparing DSAs**
- **New facilities, major mods., and facilities over the EG must “apply” the new STD-3009**
- **Other existing facilities must “evaluate” against revised SC requirements in STD-3009**
- **Most significant changes for SC controls relate to radiological consequence calculations**
- **Most significant changes for SS controls relate to co-located worker safety and chemical safety**

