

Attachment to EFCOG Best Practice #82

The Safety Basis Supplement

An EFCOG Safety Analysis Working Group (SAWG) White Paper

Purpose

The concept of a Safety Basis Supplement (SBS) has its genesis in the Justification for Continued Operations (JCO). During the development of guidance for the JCO, some sites acknowledged the need for authorization of a temporary change to the Safety Basis document in advance, when a proposed activity or temporary configuration would otherwise be out of the bounds of the existing, approved safety basis (e.g., a positive unreviewed safety question or deviation from a Technical Safety Requirement (TSR)). The Safety Analysis Working Group (SAWG) of the Energy Facility Contractors' Group (EFCOG) has developed this paper for consideration by DOE/NNSA as guidance on use and application of the SBS.

Background

Some DOE facilities have recognized the need to allow a temporary change to the facility safety basis to accommodate planned activities. Such planned activities might include special programmatic operations, maintenance, physical modifications, or decommissioning activities that temporarily place the facility outside the bounds of the approved safety basis, requiring a temporary expansion of the safety basis that would permit operations under specified conditions. One important distinction between a SBS and JCO is whether the condition is known in advance. The SBS should allow planning and approval for the condition prior to its creation, in contrast to the JCO which addresses an as-found condition of non-compliance. The SBS is used to present an evaluation of the proposed activity and design a control strategy that strives to provide a level of safety commensurate with that provided in the approved safety basis. The acceptability of additional risk which may be necessary to complete the proposed activity will be evaluated on a case basis and acknowledged with DOE/NNSA approval.

The current version of the DOE *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements* (DOE G 424.1-1B, April 8, 2010) notes that a JCO should not be used "to request a change of the safety basis for a planned operation," but offers no specific guidance as to the application or content of an alternative, temporary amendment that could accommodate planned activities.

DOE G 424.1-1B highlights the need for specific DOE approval of a planned activity. It states:

"A JCO is not an appropriate means to request a change of the safety basis for a planned operation. In that case, a request for a change to the facility safety basis should be prepared by the contractor and submitted to DOE for approval. Because the JCO is established in response to an unexpected condition, event, or new information, it is inappropriate to use it in planning new activities without specific DOE approval. A JCO amendment of the safety basis should not be used for performing a USQD for a proposed new activity."

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DOE regulation (10 CFR 830, *Nuclear Safety Management, Subpart "B," Safety Basis Requirements*) requires that a safety basis be developed by the DOE/NNSA contractor that operates a Hazard Category 1, 2, or 3 nuclear facility and that approval be obtained from DOE/NNSA prior to use. Moreover, these regulations require (specifically Section 830.201) that the contractor "must perform work in accordance with the safety basis for a hazard category 1, 2, or 3 DOE nuclear facility and, in particular, with the hazard controls that ensure adequate protection of workers, the public, and the environment." 10 CFR 830.202 further states "In maintaining the safety basis for a Hazard Category 1, 2, or 3 nuclear facility the contractor responsible for the facility must (1) Update the safety basis to keep it current and to reflect changes in the facility, the work and the hazards as they are analyzed in the documented safety analysis."

Discussion

The SBS is a document by which a DOE/NNSA contractor may request that DOE/NNSA review and approve a temporary modification of the facility safety basis and TSRs that would allow the facility to execute planned activities beyond those currently approved in the DSA and TSR. For limited duration (usually less than 1 year) activities, the SBS process offers an alternative to the requirement to process a traditional revision or safety basis amendment to the approved safety basis. An approved SBS allows a short term change to be implemented for a temporary change without creating extensive changes to the safety basis that will require restoration of the current or pending approved safety basis upon completion (which may otherwise be sub-optimal for temporary planned changes).

The request for a supplement to the safety basis might be used to cover operations such as:

- short unforeseen programmatic mission campaigns,
- special tests,
- extended outages,
- temporary process changes,
- interim design and configuration changes,
- transitory states (such as during construction or modification to implement a process change or a design change), or
- other changes that create a condition that is not consistent with the current safety basis.

The SBS contains information addressing any changes/modifications to or deviations from the information in the first five chapters specified in DOE-STD-3009, which includes an introduction, a description of the facility and its operations, the hazard and accident analysis, a description of safety SSCs, derivation of TSRs and modification (change, suspension or supplement) of the TSRs, plus any attachments that may be necessary for the approval of the SBS by DOE/NNSA. Key purposes of the SBS are to describe the

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unmitigated and the mitigated risks associated with the proposed activity and demonstrate that adequate protection of the public and workers is provided during the proposed activity. The information may be presented as a redline mark up of the changed pages or in a summary fashion that includes descriptive text of the proposed activity, capturing changes to the DSA chapters and TSRs as necessary.

Those facility operations which may continue under the SBS should be specified and considered in the evaluation. The activities may include all operations authorized by the approved safety basis or a limited subset of activities that will be performed or cannot be suspended during the operations approved by the SBS.

Examples:

1. Removing the roof plug of a facility to pull a tank defeats the ventilation system's capability to provide the differential pressure (dP) normally required to support movement of hazardous material within the facility. The existing TSR requires termination of all operations (placement of the facility into standby mode) until differential pressure is restored, thus preventing the removal of the tank. In order to ensure the facility is in a safe configuration during the evolution, the selected compensatory action requires placing all material in a stored configuration and prohibiting all other activities that could result in a release (no cutting, welding, etc.). No material movement, beyond removal of the tank, would be allowed during the period that the roof plug is not in place. The associated analysis and justification must consider other activities that will be conducted or failure modes that may be coincident with the proposed evolution. The lifting of the tank may present additional failure modes that were not previously considered.
2. Installation of a fire protection system in a vault storage area may require introduction of combustible materials and hot work activities that would not be required, nor allowed during routine operations. Possible compensatory actions include a posted fire watch, use of fire blankets and administrative spacing, as well as removal of combustible materials from the vault area at the end of each shift. In this example, because the evaluation of the unmitigated fire in the existing safety basis already assumed failure of the combustible control program and the presence of ignition sources, there is little new analysis that must be presented.

The SBS would be expected to define an appropriate set of temporary hazard controls (that is, compensatory measures) to be in effect during the life of the SBS. In some cases, these hazard controls might involve temporary changes to the facility TSRs, or in some cases suspension of a limit upon implementation of an alternate method of control. These changes should be clear and consistent with the balance of TSR controls that will represent the suite of controls that are applicable during operation under the SBS. The SBS must specifically address the applicability and modifications to the existing TSRs and the operations that are allowed under the SBS. Approval of the SBS permits modification of the TSR set. The controls or compensatory measures established in an SBS are classified as safety class or safety significant when they perform a safety function that is credited to mitigate or prevent an event in order to meet applicable evaluation guidelines and included

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in TSRs accordingly. Each proposed control should be designated as LCO, SAC, programmatic AC, etc., as appropriate and consistent with DOE's TSR guide (DOE G 423.1-1, *Implementation Guide for Use in Developing Technical Safety Requirements*) and should be presented in TSR format in a specific section when included in the SBS. The TSRs may be modified by the SBS directly in those cases in which the activity is short in duration; the applicability of the allowed deviation from the existing TSR is clear, limited in scope, and simple in application; or the SBS analysis identifies the need for an entirely new SC or SS control.

Specifically:

1. In the tank removal example presented above, the allowance not to have to meet the dP requirement is limited to the tank removal evolution. The original TSR cannot be met during the evolution and all other activities are halted during the operation, consistent with the original TSR. The temporary control is applicable only when the roof plug is removed and dP cannot be maintained.
2. Installation of fire protection in the vault storage area is also clear in scope as it applies to a limited area that is easily controlled. The applicability of the temporary TSR is clear, as the fire suppression system is out of service.

When the applicability is not clear or easily controlled (such as a single room/area), or the scope is not limited or requires complex controls, it may be appropriate to revise the TSR document to support the activity. In this case, the Contractor should submit the TSR change with the SBS and request temporary approval of the TSR set that coincides with the specific controls derived in the temporary SBS and subsequent restoration of the TSR to its previous set of controls. The DOE SER should be written to address the approval of both the TSR change and restoration to the previous safety basis once the activity for which the SBS was created is completed.

The SBS must be prepared and approved in advance of the activity. The content of the SBS is dependent on the safety significance of the situation, duration of the activity and the complexity of compensatory measures being applied during the period the SBS is in effect. The degree of rigor of an SBS must be sufficient to present the activity and evaluate the effect the change has on the existing analysis. If the proposed activity introduces new hazards, the evaluation must consider if the hazard categorization of the facility has changed. If the categorization of the facility increases, an SBS is not appropriate to support the proposed activity, rather a new or revised DSA (and associated TSRs as needed) is necessary. An SBS cannot be used to temporarily change the facility hazard categorization.

Thorough consideration of the proposed activity must be presented together with a conclusion regarding the impact of the proposed activity on the risk that DOE/NNSA is asked to accept during the evolution. Every effort will be made to ensure that the modified control set provides a level of safety commensurate with that originally approved by DOE/NNSA. In those cases where the risk may be increased, the risk that DOE/NNSA will be asked to accept during the evolution must be clearly presented and justified (e.g., absence of practical alternatives). Both cases require a technical basis for the acceptability of the

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proposed compensatory actions. DOE/NNSA verifies the adequacy of the proposed compensatory measures prior to approving the SBS.

The level of evaluation and justification required is directly proportional to the complexity of the activity and proposed controls. The analysis or controls may be grossly conservative to simplify analysis and ensure the risk presented by the activity is bounded and properly controlled.

Example:

The prohibition of explosives on a site may be suspended in order to allow a convoy of explosive material to pass a nuclear facility by imposing a route control that is at a sufficient distance from the facility to ensure the facility is not affected, should the material be set off in transit, thus providing a level of safety that is commensurate to the approved safety basis. The analysis can be limited to a conservative estimate of the potential blast energy that would be produced by the convoy's inventory rather than providing detailed calculations that may be required of a closer path.

The scope of each SBS should be narrowly defined, dealing with only one specific evolution or activity, or certainly limited to a series of actions that support a given end point that can be clearly defined, representing restoration or implementation of the existing approved safety basis. The effect of the activity must be reviewed in light of the facility's condition. In other words, the analysis must consider the effect that the change may have on all other authorized conditions/activities that will or would be authorized to occur while the facility operates temporarily in the altered configuration, under the SBS. The SBS should map the compensatory measures applicable to each control, demonstrating effectiveness in all scenarios that relied upon that control, consider the interaction between controls, and clearly state how compensatory measures would be discontinued as the original equipment/control is restored. Note that verification will typically include performance of surveillance requirements and may require a readiness demonstration if procedures or equipment are modified.

The SBS should have a pre-defined limited life, only as necessary to perform the explicitly authorized activity. The life of the SBS should usually be less than a year (note that permanent change or long term activities must be incorporated into the safety basis at annual update through a revision of the DSA). The SBS must define the termination point of the life of the SBS in a configuration that ensures compliance to the existing, approved safety basis at completion of the temporary activity. In most cases, this would take the form of a functional point, such as the completion of the proposed activity. Termination of the SBS requires demonstration and verification of restoration of the approved control set. A calendar date for the termination point is not recommended, because schedules are subject to change due to unforeseen circumstances, and hence, a calendar date may become problematic. However the termination point(s) may be defined in the SBS as activity completion or expiration of a conservative time allowance, whichever occurs first.

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Change Management

The SBS is a modification of the safety basis. As such it requires approval by DOE and is not subject to the USQD process at its initiation.

Changes affecting the safety basis as modified by the SBS must be evaluated via the existing USQ process considering both their impact on safety for normal operations (without the SBS) and for operation with the SBS in effect. Any proposed activity that would result in a USQ for operation under the SBS must be resolved (e.g., change deferred, SBS revised and re-approved) before the proposed activity can proceed. Proposed activities that are not a USQ under the SBS but would result in a USQ under the safety basis without the SBS must also be resolved because there is no mechanism to ensure this USQ would otherwise be resolved prior to exiting the SBS.

Consistent with 10 CFR 830.202, the SBS is subject to the annual update process. Therefore, the following apply:

- a. If the original DSA/TSR goes through an annual update while the SBS is in effect, but the SBS is not incorporated, changes made to the DSA/TSR in the annual update must be reviewed to ensure that they do not adversely impact the SBS;
- b. If the SBS will be effective during the period that the annual update to the DSA/TSR is being prepared and if the SBS will be required after the DSA/TSR annual update is approved and the SBS itself will be in effect for more than a year (although the expectation is that SBS are to support proposed activities much less than 1 year in duration) the SBS should be included in the DSA/TSR annual update.

Implementation

When DOE/NNSA approves the SBS, the SBS is a temporary modification of the safety basis that would permit operations under specific conditions with alternate controls or modified TSRs. The DOE/NNSA-approved SBS becomes a part of the facility safety basis. For those facilities having an Authorization Agreement (AA), the SBS must be added to the AA prior to implementation. The SBS process would therefore require a means for the formal incorporation of an approved SBS into the facility safety basis. It is anticipated that contractors will develop a procedure addressing when and how to use the SBS process. The SBS should be consistent with other documents, such as the emergency preparedness hazard analysis, vulnerability assessments, or fire hazard analysis which may be affected by the proposed activity. The SBS should address changes to conclusions and controls in these documents if necessary. A single SBS document can be used to document the changes to both the DSA and the TSR (see previous "Discussion" section for expectations on when changing the actual TSR document would be appropriate). This facilitates control and implementation of the temporary configuration. The process used to implement and verify safety basis documents is applicable to the SBS as well. Implementing documents such as procedures, round sheets, etc., must be modified or uniquely developed to support the implementation of the SBS. Personnel are required to be trained or qualified as necessary. Readiness demonstrations or implementation verification reviews should be performed to

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ensure the compensatory actions are properly implemented prior to start of the proposed activity. Similarly, restoration of the implementing documents and original safety basis controls must be verified before the SBS controls can be discontinued. Verification is required in accordance with site procedures/processes.

Conclusions

The SBS is a mechanism by which a DOE/NNSA contractor that operates a Hazard Category 1, 2, or 3 nuclear facility may request that DOE/NNSA review and approve a temporary amendment to the facility safety basis, including applicable TSRs, that would allow the facility to operate in an intentionally altered state for a limited period of time, based on the safety significance of the situation, and the compensatory measures being applied during this period. When DOE/NNSA approves an SBS, the approval is a temporary modification of the safety basis that would permit additional operations under specified conditions until reaching the defined termination point. An approved SBS is a part of the facility safety basis.

The EFCOG SAWG therefore recommends:

- The scope of each SBS should generally be narrowly defined, dealing with only one specific activity or series of activities to reach a defined condition (end state), and describe how compensatory measures will be removed as the original safety basis is restored.
- The SBS should be prepared with sufficient detail to communicate all proposed changes to the existing safety basis (and other affected documents, such as the emergency preparedness hazard analysis, vulnerability assessments, or fire hazard analysis), provide supporting analysis as required, and identify proposed controls as developed from the analysis.
- The SBS should define a set of temporary hazard controls (that is compensatory measures) capable of providing an appropriate safety envelope which will be in effect during the life of the SBS. These controls may replace/modify the existing approved TSRs and are subject to the rules of enforcement.
- The SBS should have a pre-defined limited life, only as may be necessary to perform the proposed activity.
- The SBS process described in this EFCOG White Paper (e.g., purpose, restrictions, content, and approval) should be described in Site procedures (Contractor and DOE) covering safety basis document development and/or the USQ process. However, incorporating the SBS process into the USQ process procedure, which DOE approves, does not eliminate the need for DOE/NNSA approval of individual SBS documents.

The EFCOG SAWG further recommends that DOE G 424.1-1B and DOE G 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*, be modified to include discussion of the SBS and the terms of its use.

ATTACHMENT

Suggested Safety Basis Supplement Content

Development of the SBS should address the following six points from 10 CFR 830 Subpart B Section 830.204(b):

- (1) Describe the facility (including the design of safety structures, systems and components) and the work to be performed;
- (2) Provide a systematic identification of both natural and man-made hazards associated with the facility;
- (3) Evaluate normal, abnormal, and accident conditions, including consideration of natural and man-made external events, identification of energy sources or processes that might contribute to the generation or uncontrolled release of radioactive and other hazardous materials, and consideration of the need for analysis of accidents which may be beyond the design basis of the facility;
- (4) Derive the hazard controls necessary to ensure adequate protection of workers, the public, and the environment, demonstrate the adequacy of these controls to eliminate, limit, or mitigate identified hazards, and define the process for maintaining the hazard controls current at all times and controlling their use;
- (5) Define the characteristics of the safety management programs necessary to ensure the safe operation of the facility, including (where applicable) quality assurance, procedures, maintenance, personnel training, conduct of operations, emergency preparedness, fire protection, waste management, and radiation protection; and
- (6) With respect to a nonreactor nuclear facility with fissionable material in a form and amount sufficient to pose a potential for criticality, define a criticality safety program that:
 - (i) Ensures that operations with fissionable material remain subcritical under all normal and credible abnormal conditions,
 - (ii) Identifies applicable nuclear criticality safety standards, and
 - (iii) Describes how the program meets applicable nuclear criticality safety standards.

Incorporation of these points is described below. Safety analysis is performed in accordance with the method applied in the existing approved safety basis and this is not considered to be an alternate methodology.

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The following topics should be addressed in an SBS. The notation (e.g., 830.202(b)(1)) indicates the 10 CFR 830 section applicable to the identified SBS topical area.

1. Executive Summary (Optional, depending on length of document)
2. Purpose of the SBS (830.202(b)(1))
3. Discussion of Background (What proposed activity and subsequent condition(s) led to need for SBS, description of deviations or exceptions to chapter 2 of the existing safety basis) (830.204(b)(1))
4. Impact on Hazards/Risks (Increases in hazards/risks due to the condition, description of deviations or exceptions to chapter 3 of the existing safety basis. Evaluate the effect of the proposed change/ modification on the hazard categorization of the facility. Note, if categorization is adjusted upward, a new safety basis document will be required.). (830.202(b)(2)), (830.202(b)(3)), (830.204(b)(2)) and (830.204(b)(3))
5. Adequacy of Compensatory Measures (Risk-reduction activities being applied, with a description of deviations or exceptions to chapters 4 and 5 of the existing safety basis). It is unlikely that the change would affect Safety Management Programs beyond the compensatory measures described. Additional consideration, if necessary, should also be described. These proposed changes can be presented by the applicable chapter of the existing DSA or collected in summary format. (830.202(b)(4)), (830.204(b)(4)), (830.204(b)(5)) and (830.204(b)(6)) as applicable
6. Statement of Conclusion/Justification --Net Risk Considerations (Risk basis for SBS)
7. Alternate or revised control set (Modification to TSRs, which may include revision, suspension, or creation of additional or supplemental controls that serve as the approved TSRs during the effective period of the SBS) (830.202(b)(5)). A modified TSR document should be submitted if necessary.
8. Termination of SBS (Those events/ date that will allow termination of SBS)