

MANAGING THE SAFETY ANALYSIS REPORT AS A PROJECT

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ABSTRACT

The development of Safety Analysis Reports (SARs) at the Los Alamos National Laboratory has been a mixture of success and failure. An examination of this process determined that recurring (systemic) failures in the SAR process had contributed to an overall failure to produce a document acceptable to the Department of Energy (DOE). Failures included such things as (1) changing scope, (2) lack of understanding of DOE requirements, (3) changing DOE expectations, or (4) the facility delivering a final “over the fence” product with no early DOE involvement.

As these failures were examined, the Laboratory decided to experiment with a new process that treated SAR development in the same way as other “projects.” Using a construction project as the model, a process was developed that would ensure the following.

- The SAR scope would be set early with the help of DOE.
- A schedule and cost would be estimated at the beginning.
- Changes to the scope, schedule, and cost would be examined through a formal change control process.
- SAR progress would be monitored at set stages in the form of a formal review.
- Deficiencies in the product would be caught in the early phases of a project.

The perceived advantages to this approach include the following.

- A product is not sent “over the fence” that took a wrong turn early and then required substantial cost investment to go back and correct.
- A formal recognition on both sides of the scope, schedule, and cost.
- A formal method for change control.
- A method for ensuring quality.

The experience to date is mixed given that all SAR projects at the Laboratory are being backfit into the new approach. Some successes with the process and lessons learned will be discussed in the paper. The translation of the process into a new SAR review plan for Los Alamos also will be discussed.

INTRODUCTION

The development of Safety Analysis Reports (SARs) at the Los Alamos National Laboratory has been a mixture of success and failure. Many facilities had produced SARs in a timely fashion and obtained Department of Energy (DOE) approval, but others had not. The Laboratory and DOE both recognized that many of the safety analysis efforts that had failed also showed a pattern of having gone through a cycle of write and rewrite over a number of years, causing costs to skyrocket and facility staff to be demoralized.

The first step in addressing the problem was to systematically examine the causal factors leading to SAR failures. An examination of the SAR process determined that recurring (systemic) failures contributed to an overall failure to produce a document acceptable to the DOE. Failures included such things as (1) changing scope, (2) lack of understanding of DOE requirements, (3) changing DOE expectations, or (4) the facility delivering a final “over the fence” product with no early DOE involvement.

The early strategy in improving the SAR process was to plan both for long-term and short-term improvements. One of the first improvements was to try and break the chain of write/rewrites of SARs. A new SAR development process was proposed for this. This new process is the focal point of this paper.

NEW PROCESS

As these failures were examined, the Laboratory decided to experiment with a new process that treated SAR development in the same way as other “projects.” Using a construction project as the model, a process was postulated that would strive to achieve the following.

- The SAR scope would be set early with the help of DOE (much like the baseline in a project).
- A schedule and cost would be estimated at the beginning.
- Changes to the scope, schedule, and cost would be examined through a formal change control process.
- SAR progress would be monitored at set stages in the form of a formal review.
- Deficiencies in the product would be caught in the early phases of a project.

The advantages and philosophy of the process are discussed in the next section. Details of the process and examples of milestones are presented next.

Advantages to the Process

To be successful, the SAR development, review, and approval efforts must be coordinated and managed like an integrated project. A structured approach works best to accomplish a large task involving several organizations. The project structure defines the individual tasks, identifies organizational responsibilities, formalizes interfaces between organizations, and establishes the schedule and budget. The process advocated in this paper is based on an integrated project concept.

DOE-STD-1104, *Review and Approval of Nonreactor Nuclear Facility Safety Analysis Reports*, encourages interface between the SAR development review processes to facilitate the review process and for early identification and resolution of potential issues. Lack of reviewer interaction during the SAR development process often leads to major issues raised by reviews conducted very late in the development process. The resolution of such issues can have a major effect on cost, schedule, and facility operations, particularly if extensive rework is required. It is essential to identify major issues early in the process. Therefore, early and continued interface between the review team and development teams is a key element of the process outlined in this paper.

Although interaction is necessary, the review team must maintain a certain degree of independence from the development team. The review team must not interject themselves into the development process. A common approach is to conduct a small number of interim reviews of portions of the SAR before a review of the entire document at the end and to use a standards-based approach. This is now a key goal of the safety process at the Laboratory.

Managing the SAR effort like a project also promotes completion of the effort in a reasonable period of time. Experience has shown that SAR development and reviews tend to drag out over extended periods of time unless the efforts are disciplined. Activities must be scheduled, milestones must be established, resources must be identified and provided, and the schedule must be used to manage the work. Organizations must be held accountable for completing their assigned tasks on time; this includes review organizations and development organizations.

One factor that makes managing a SAR effort challenging is the lack of a single Project Manager with the authority over all Laboratory organizations involved in the process. In the process described here, the organization responsible for developing the SAR is assigned the responsibility for overall project coordination, but the success of the effort depends on each organization assuming responsibility for its assigned tasks and managing its own efforts to comply with project requirements and schedules.

The process outlined in this plan involves several sets of deliverable packages and several reviews for each SAR. To be accomplished efficiently, the entire process should be defined and scheduled at the beginning of the effort. The specific reviews and the scope of each review should be defined early in the project, typically in a SAR Project Review Plan, which should be an integral part of the SAR preparation plan. Interim milestones and reviews should be scheduled. Advance planning is important to identify necessary resources and allow review organizations an opportunity to obtain them.

Outline of Process

The steps outlined in this process are intended as a general guide, and the process should be tailored as necessary for each specific SAR. Some of the following activities must be conducted in parallel. The order of presentation is generally, but not always, serial.

- 1. Develop the Project Plan and Schedule.** The SAR Project Manager will develop a project plan and schedule for SAR development, review, and approval. The project plan may be a simple scope statement or a comprehensive document establishing detailed activities for SAR development. At a minimum, the Project Plan should establish the scope of the SAR, applicable standards, requirements, expectations, schedule, and required resources.
- 2. Appoint the Review Team Leader.** When a SAR development effort has been initiated, a Review Team Leader will be appointed.
- 3. Present the Project Plan and Schedule to the DOE Approval Authority.** The SAR Project Manager and Review Team Leader will refine the SAR project plan to accommodate the review and will present the Project Plan and schedule to the DOE approval authority and obtain concurrence.
- 4. Assemble SAR Development Team.** The SAR project manager will obtain resources for the SAR development effort.
- 5. Assemble the Review Team.** The Review Team Leader will identify the necessary subject matter experts (SMEs) to serve on the review team. The review team will be assembled when necessary over the course of the review to perform necessary team functions.
- 6. Conduct Kick-off Meeting.** The SAR Project Leader will schedule a kick-off meeting at the appropriate time. Typical expectations and goals of the kick-off meeting are presented in Table 1.

Table 1. Example Attributes of SAR Milestones

	Review Kick-Off Meeting	30% Review	70% Review	90% Review
Expectations and Goals	<ul style="list-style-type: none"> • Team orientation. • Tour facility. • Define review goals and expectations. • Specification of team roles and responsibilities. • Identification of external reviewers and observers. • Review schedule and milestones. • Outline of SAR Review Plan and assignments. • Records management and QA considerations. • Security considerations. 	<ul style="list-style-type: none"> • Facility description, including facility processes and major activities defined. • Hazard and accident analysis methodologies. • Hazard identification, characterization, and evaluation. • Risk ranking of postulated accident scenarios. • Identification of candidate safety structures, systems, and components (SSCs) [safety-class (SC) and safety-significant (SS)]. • Identification of candidate accidents to be analyzed. 	<ul style="list-style-type: none"> • All content in 30% review package updated and with comments incorporated. • Preliminary accident analysis. • Safety function and safety system descriptions per DOE-STD-3009-94, Chap. 4 for safety SSCs. • Refined performance requirements identified through safety system evaluations. • Criticality safety evaluations and controls identified. • Preliminary set of Technical Safety Requirements (TSRs) [limiting conditions for operation (LCOs)] and operational considerations for maintaining safety SSCs. • Emergency management program described. • Radiation and hazardous material protection programs described. 	<ul style="list-style-type: none"> • Finalization of: <ul style="list-style-type: none"> - accident analysis; - safety functions, safety system descriptions, functional and performance requirements, and system evaluations; - derivation of technical safety requirements; and - institutional programmatic controls.
Considerations	<ul style="list-style-type: none"> • Team Leader will have primary responsibility for developing SAR Review Plan with team members providing input. • Develop protocols for interfacing with facility personnel and SAR development team. 	<ul style="list-style-type: none"> • Arrange facility presentations and conduct facility walkthroughs. 	<ul style="list-style-type: none"> • Defense-in-depth strategies identified and evaluated. • Verification of accident analysis computational code applicability and use. 	<ul style="list-style-type: none"> • All comments and safety issues have been completely resolved or vulnerabilities have been identified, compensated, and action items have been committed to for their resolution with a detailed schedule agreed upon by the Review Team Leader.

7. Prepare the SAR Review Plan. Before the start of the review, the review team will prepare the specific SAR Review Plan. The scope of the plan may vary depending on the scope and complexity of the review effort and may include the following elements.

- Review objectives and expectations
- Review milestones and schedules
- Team roles and responsibilities
- Protocols and work methods
- Quality assurance, security, and records management considerations
- Interfaces with other review groups (e.g., DOE)
- Review documentation (interim and final)
- Review criteria

8. Perform Reviews. Reviews normally will be performed at several stages in the development process. Table 1 shows typical examples of the material that could be included in 30%, 70%, and 90% reviews. These points are recommendations; the number of reviews and the material included in each review should be tailored to the specific SAR. Milestones should be established in the initial planning, but the detailed contents of each review package should be negotiated by the SAR Project Leader in consultation with the Review Team Leader. The Review Team Leader ensures that comments are prepared rigorously following a set of established comment rules to avoid open-ended comments and to assist the document preparers in resolving the comments.

9. Resolve Comments. The SAR Project Leader and the SAR development team will resolve all review comments designated as essential in writing.

10. Resolve Conflicts. Every attempt should be made to resolve review comments. Resolution is referred to successively higher management levels as needed to resolve essential comments.

11. Determine if Changes to Scope are Necessary. If changes to the scope of the SAR are necessary then both DOE and the SAR project team will present their recommendations for change to a Change-Control Board. Examples of change to scope may include additional accident analysis, additional control development, etc.

12. Review Team Concurrence. After all comments from the 100% review phase have been resolved, the review team will document satisfactory completion of the review with a memorandum to the Laboratory manager responsible for approving the SAR. Any dissenting team member opinions will be submitted with this memorandum.

EXPERIENCE WITH PROCESS

The perceived advantages to this approach include the following.

- A product that is not sent “over the fence” that took a wrong turn early and then required substantial cost investment to go back and correct.
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- A formal method for change control.
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Review comments are presented jointly by DOE and LANL reviewers to the document developers. This supports a common understanding between DOE and LANL reviewers on what kind of comments are essential or suggested (the two comment categories). Additionally, process supports a uniform approach and understanding that will provide DOE with a general understanding of the depth of verification for the Laboratory review that will ultimately provide an underpinning for DOE reviews where the Laboratory review is conducted and resolved before the document is sent to DOE. The latter is a common

application of the quality process where confidence in the provider's inspection process supports acceptance of the final product.

As the process has progressed, we have encountered problems that stem from implementation of the new process to ongoing SAR development processes. These problems have been manifested as disagreement on the hazard analysis approach and method of documentation, lack of standardization for performance of nuclear consequence determination, lack of a common set of expectations for the preparation of the safety document and its elements, and lack of general agreement among the reviewing parties for what constitutes an important deficiency. We have also encountered difficulties associated with ambitious schedules that are, unfortunately, already negotiated with DOE before this process was implemented. These schedules were developed without the benefit of the SAR development plans and a clear understanding of what currently constitutes a successful SAR. This has resulted in slipped schedules, increased facility costs, and renegotiation between the Laboratory and DOE for these important measures. Lessons learned are being incorporated in the development of a general review plan and a guide that will be available to SAR preparers.

Improvements are coming in the form of reviewers who are developing more rigor in their review using a standards-based checklist and the comment rules. Working together with DOE has fostered a more uniform set of expectations between the Laboratory reviewers and DOE that will improve the credibility of the review process. Resources and timing remain tough problems, particularly for this year as many safety documents are due before the end of the fiscal year and the slips we have encountered are backing up work that will need to be completed in an even more compressed schedule.

Finally, management is supportive of the process to produce quality SARs and other safety documents that are not a function of "what DOE will buy" but are based on fundamental quality using DOE Std. 3009 and well-founded hazard and safety analysis methods that will withstand scrutiny independent of the personality of the document approver. Early and frequent involvement between document developer and reviewer will promote a quality standard that will propagate and lead to cooperative improvement rather than grudging compliance. The goal of quality safety documents is achievable and the internal Laboratory review process is an integral element in reaching that goal.