

## **Assuring the Quality of Safety Analyses and Safety Analysis Documentation<sup>a</sup>**

**John E. Johnson  
Idaho National Engineering and  
Environmental Laboratory  
P.O. Box 1625, MS-3750  
Idaho Falls, Idaho 83415-3750  
(208) 526-1098  
jejohnso@inel.gov**

In past meetings of the EFCOG Directors and working group chairs, a concern has been expressed that there are too many comments by DOE reviewers of safety analysis reports (SARs), resulting in costly rework of the documents and delays in completing DOE approval. The Safety Analysis Working Group (SAWG) Steering Committee has determined that a white paper was needed that would provide guidance and recommendations to contractors on improving the quality and acceptability of SARs and other safety analysis documents prior to their submittal to DOE. This should make the DOE review and approval process more expeditious and less contentious.

Planning, preparation, and submittal of these documents might perhaps be pursued in a manner similar to a quality-related procurement, where customer needs, expectations and acceptance criteria are established in advance. Then the product/service provider, the contractor, should apply various quality control processes to assure the desired characteristics of the product safety analysis documents. Improving the quality and acceptability to DOE of safety documents at first submittal should result in a more expeditious DOE review and approval process, reducing costs of rework and recycle through reviews.

The following factors have been identified as having an effect on the quality and acceptability to DOE of safety analysis documents:

- Obtaining early agreement with DOE on expectations for the product documentation (e.g., scope of coverage, key assumptions, methodologies, format) and review criteria,
- Availability of adequate funding for the safety analysis task,
- Detailed planning of the safety analysis and document preparation,
- Training and experience of the safety analysts and reviewers,
- Use of documented review criteria by contractor reviewers,
- Ownership of, and participation in, document development by facility management prior to submittal to DOE, and
- Periodic communication with DOE customer during document preparation to obtain early indications of changes in expectations and to discuss analysis results.

These factors and others, such as management of independent review processes, were discussed at the SAWG's Authorization Basis (AB) Workshop at Las Vegas in January 2000. This paper provides a summary of the discussions on this issue at the AB Workshop, lessons learned shared by the participants, and progress towards a SAWG "white paper" on recommendations for improving the quality and acceptability to DOE of safety analysis documents. The AB Workshop session was well attended by both DOE and contractor people, and most people participated actively in the discussions. The workshop discussions and likely SAWG recommendations are presented under the following headings: Establishing Customer Expectations, Planning, and Independent Review Processes.

## **Establishing Customer Expectations**

In any quality-related procurement, establishing and documenting the customer's expectations (i.e., acceptance criteria) in advance is essential to success. Safety analysis documents generally have two customers -- the contractor facility/program manager and DOE. These two parties may have somewhat different expectations for the safety analysis product, so gaining agreement in advance among all parties on the acceptance criteria is important. Several important elements were identified in establishing customer expectations:

- Agreement must be reached on the scope of the safety analysis task. The scope of the operation(s) and systems to be addressed must be well understood.
- Agreement should be established on the format of the product. All parties should agree on whether the task involves revising an existing safety analysis document, maintaining its original format, or whether a new document will be created in an updated format. Use of established document format and content guides such as DOE-STD-3009 should expedite reviews.
- Applicability of various requirements (i.e., old versus new) should be established up front. Facility design requirements may have changed with time, and safety analysis methods/requirements may have changed since a facility's SAR was originally written.
- Agreement should be reached on key assumptions and potentially controversial approaches. These may need to be revisited periodically during the analysis.

At least one site (Hanford) has developed a criteria document for safety analysis document preparation. This practice was initially used to achieve uniformity of methods and documentation among several safety analysis subcontractors. The SAWG will likely recommend this practice and possibly a format for such a safety analysis criteria document.

## **Planning**

It was agreed that up-front, detailed planning of safety analysis tasks is important to their success. The following elements of planning were established as important:

- The total scope of the task must be well understood, and the different technical disciplines to be involved must be identified.
- Trained and qualified personnel must be assigned to the task. If necessary, special training should be provided to the assigned analysts.
- Facility ownership and participation is essential in planning the work. A team approach was recommended, involving knowledgeable facility personnel, the safety analyst(s), and the necessary specialty disciplines. Close communication and understanding of roles among the team members is essential.
- The project funding needs should be identified and a schedule developed that are consistent with producing a high-quality product. It was agreed that too often these are imposed externally with little input from detailed planning.
- Planning should include required peer reviews of specialty engineering analyses.

- Implementation planning should be done by facility management in parallel with development and documentation of the safety analysis. Facility management must know that the controls specified in the safety analysis can be implemented.

At least two sites, Savannah River and INEEL, have standardized sitewide SAR chapters that contain the site description, safety programs descriptions, and management organization portions of a DOE-STD-3009 format SAR. Thus, new SARs can make use of these, allowing dedication of resources more effectively on the safety analysis aspects of SAR preparation.

### **Independent Review Processes**

It was agreed that independent review of the safety analysis documents, both by the contractor and by DOE, requires advance planning and assignment of the right people to be effective and efficient. The following points were generally agreed upon in this area:

- A team approach to comprehensive independent reviews is the most effective. The team leader must be highly knowledgeable on safety analysis and the facility, and must exert strong leadership such that the team speaks with one voice. It was recommended that the team leader for DOE reviews should be from line management. The review team should include experts in appropriate disciplines.
- A review plan should be prepared by the review team leader. The review plan should provide the criteria to be used for measuring the acceptability of the SAR. The review team should fully understand the agreed-upon expectations and key assumptions established in advance.
- It was suggested that an approach similar to the DOE ISMS Phase II verification team efforts currently being done across the DOE complex be considered for SAR reviews. That is, short-term, high-intensity team reviews could be done by appropriate subject matter experts more efficiently than by traditional long-term, more casual reviews.
- A review kick-off briefing provided by the safety analysis team is valuable in bringing the review team up to speed; however if done improperly, such a briefing could be viewed as an effort to improperly influence the review. The briefing should provide background information on the facility/system and the evolution of the safety analysis.
- In some cases for review of large SARs, it may be appropriate to expedite independent review by conducting it in phases. For example, the Hazard Analysis section could be reviewed upon completion, then the Accident Analysis and controls portions (Safety SSCs, TSRs Derivation, etc.). Such a phased review approach could provide early warning that a chosen approach is doomed to failure, reducing the wastage of resources.
- Comments from the review team should not be in the form of questions. If questions arise in the minds of the reviewers, they should be answered by the safety analysis team during the review. The review team leader should ensure the quality and consistency of comments returned.
- Safety analysts should not try to use the independent review process as an aid to help complete the safety analysis product. The product should be complete and should meet the intended expectations criteria before submittal to independent review.

## **Summary / Path Forward**

In summary, improvements in the quality of safety analyses and safety analysis documents can be achieved by application of some of the principles used in quality-related procurement processes. These include the establishment of customer expectations and acceptance criteria in advance, detailed planning by the safety analysis organization in performing the safety analysis tasks and preparing the product document(s) so as to meet the established expectations, and proper management of the independent review processes to make them effective in assuring the quality and acceptability of the product.

At the AB Workshop in January 2000, ten people volunteered to help develop the SAWG white paper and recommendations for improving the quality of safety analysis documents. These volunteers, along with the SAWG Steering Committee, will be called upon to reach consensus on the white paper and recommendations. Upon approval by the Steering Committee, the white paper will be issued for use by the SAWG contractors.

---

<sup>a</sup> Work supported by the U.S. Department of Energy under DOE Idaho Operations Office Contract DE-AC07-99ID13727.