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MARTIN MARIETTA

Safety Analysis Report Update Program

UNREVIEWED SAFETY QUESTION DETERMINATION APPLICATION GUIDE

September 1991

SAR UPDATE

Issued by:

Central Safety Evaluation Team

MARTIN MARIETTA ENERGY SYSTEMS, INC.
Oak Ridge, Tennessee

Prepared for the U.S. Department of Energy
under U.S. Government contract DE-AC05-84OR21400

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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DEFINITIONS AND ACRONYMS

Accidents	Anticipated operational transients and postulated design basis accidents considered credible, therefore warranting inclusion in the authorization basis.
Anticipated Operational Transient	A temporary, usually rapid change in process parameters. Their likelihood of occurrence is sufficiently large such that they may be expected to occur during the lifetime of the facility.
AEC	Atomic Energy Commission
As-found condition	A discrepancy between the performance or some other attribute of an element of a facility and an assumption about that facility element used in the safety analysis process.
Authorization basis	The aspects of the facility design basis relied upon by the original approving body to authorize operation. It includes (if they exist) the facility Safety Analysis Report, Technical Safety Requirements (or Operational Safety Requirements), DOE-issued safety evaluation reports (sometimes generated to document DOE's basis for approving a Safety Analysis Report), any facility-specific commitments made in order to comply with DOE orders or policies, and any Safety Analysis Report Update Program documents that have PSET review and approval.
Change	A physical modification to a facility, a change to a facility procedure, a discrepancy between an attribute of a facility as it actually exists and the way it was described or assumed in the authorization basis, special tests, experiments, or temporary physical modifications.
COR	DOE Contracting Officer's Representative
DOE	Department of Energy
ITS	Important-to-Safety
NRC	Nuclear Regulatory Commission
Operational Safety Requirements (OSR)	A binding agreement or contract between DOE and Energy Systems that defines the conditions, safe boundaries and bases thereof, and the management control required to ensure safe operation of the facility. The OSRs are a part of, and based upon, the analysis in the Final Safety Analysis Report.

PRA	Probabilistic Risk Assessment
Safety Analysis Report (SAR)	A document that summarizes the hazards associated with the operation of a particular facility, analyzes accidents associated with the hazards, and defines minimum safety requirements.
Safety Evaluation	A part of the USQD documentation that evaluates the potential effects of the change on the authorization basis. The safety evaluation gives the logic for determining whether or not a USQ exists.
Safety Evaluation Report	A document that may be prepared by DOE giving the basis for approving a Safety Analysis Report.
Technical Safety Requirements (TSR)	A new term encompassing Operational Safety Requirements and nuclear reactor Technical Specifications.
Technical Specifications	Technical Specifications apply to nuclear reactors. They are equivalent to Operational Safety Requirements.
Unreviewed Safety Question (USQ)	An issue indicating that a facility could be outside its authorization basis.
Unreviewed Safety Question Determination (USQD)	A formal, documented evaluation to ascertain if a change could result in a facility being outside its authorization basis.

EXECUTIVE SUMMARY

The basic purpose of the Unreviewed Safety Question Determination (USQD) process is to ascertain if a change (modification, test, or experiment) to a facility can be made without a prior safety review and approval by the original approving body. The USQD process judges whether the change could result in the facility being outside its authorization basis. If the change could result in the facility being outside its authorization basis, the change involves an Unreviewed Safety Question (USQ). The authorization basis consists of those aspects of the facility design basis relied upon by the original approving body to authorize operation. The authorization basis would typically include (if they exist) the facility Safety Analysis Report, Technical Safety Requirements (TSRs), Operational Safety Requirements (OSRs), Technical Specifications, DOE-issued Safety Evaluation Reports, Safety Analysis Report Update Program documents, Safety Studies, Safety Assessments, Risk Assessments, Facility Safety Evaluations, and any applicable commitments made to comply with Department of Energy (DOE) orders or policies.

If a change to a facility could not result in the facility being outside its authorization basis (i.e., does not involve a USQ) and if the change does not result in a change to the facility TSRs (OSRs or Technical Specifications), then the change may be implemented without prior review for safety by the original approving body. Otherwise, the change may not be physically implemented without prior approval by the original approving body. Other normal reviews (e.g., DOE, budgetary reviews) could still be required. The purpose of this document is to give guidance on the preparation of USQDs. Even though it is outside the scope of this document, information on the change process is provided for context. DOE has chosen to delegate Martin Marietta Energy Systems, Inc. (Energy Systems) the authority to review and implement changes that involve a USQ to most generally accepted and low hazard class facilities. Specifying the change process and the Energy Systems safety review that would be performed in lieu of the DOE safety review is outside the scope of this document. That Energy Systems change process and safety review should be specified by the site procedures implementing the USQD process.

Changes to a facility may include proposed changes to the facility configuration, changes to facility procedures, changes to other policies and procedures that could affect facility operation, and experiments or tests not described in the facility's authorization basis. In addition to proposed changes to a facility, the USQD process may be used to evaluate as-found conditions. If it is found that some attribute of the facility differs from that expected or described in the authorization basis, then the USQD process may be used to determine if this as-found condition could have resulted in the facility being outside its authorization basis.

This determination as to whether or not a change could result in a facility being outside its authorization basis allows a devotion of resources to review of the changes that are more significant from a safety perspective.

Except for as-found conditions, the USQD is performed before the change is physically implemented. For physical changes to a facility, the USQD should be complete before the start of construction of the change. For changes to procedures, the USQD should be complete before the revised procedure is released for use. Generally it is desired to perform the USQD as early in the development of the change as possible. This desire must be balanced by the need to have sufficient information about the change upon which to base the USQD.

The first step in the USQD process is to define the change being evaluated. The USQD must evaluate the process by which the change is accomplished. All intermediate steps of the change must be considered. Then the potential effects of the change, both during and after the change, on the facility are determined. These potential effects of the change are compared to the authorization basis for the facility to determine if the change could result in the facility being outside its authorization basis. The conclusion and the process that was used in reaching the conclusion must be sufficiently documented so that another individual can understand how the conclusion was reached and verify that the conclusion was correct. In addition to evaluating the intermediate steps, the USQD should address the final installed configuration.

The USQD will provide input to the change control board for facilities placed under configuration management to aid their understanding of the extent of a proposed change and whether or not the change should be authorized. The USQD will also provide input to the categorization of reportable occurrences under DOE Order 5000.3A, Occurrence Reporting and Processing of Operations Information.

Chapter 1 provides an overview of the steps in the USQD process. Chapter 2 and the appendices provide detailed instructions and examples intended primarily for use by the personnel who perform, review, and approve the USQDs.

1. OVERVIEW

1.1 INTRODUCTION

The purpose of the Safety Analysis Report (SAR) Update Program is to update safety documentation for all facilities, both nuclear and non-nuclear, operated by Martin Marietta Energy Systems, Inc. A summary description of this program may be found in ref. 1. Significant hazards and the risk associated with those hazards will be identified by updating the safety documentation. The question arises as to how modifications to facilities, especially those with approved safety documentation, will receive Department of Energy (DOE) review and approval. This USQD Application Guide describes the approach for the Energy Systems evaluation of facility modifications. The USQD process may also be applicable when as-found conditions differ from facility documentation. While the USQD process builds off the documents produced by the SAR Update Program, the USQD process is intended to continue after the SAR Update Program is complete.

1.2 BACKGROUND

The USQD concept was originally developed for the Vallecitos Boiling Water Reactor. At the time the USQD process was developed, the regulator of the nuclear power industry was the Atomic Energy Commission (AEC). When the AEC issued one of the first licenses for Vallecitos to operate in the late 1950s, the license required the owner to submit to the AEC information about every modification, test, and experiment that was not already described in the reactor's authorization basis. These proposed modifications, tests, and experiments had to be approved by the AEC before they could take place. This arrangement proved to be a burden on both the reactor owner and the AEC. To resolve this issue, the reactor owner and the AEC developed an amendment to the reactor's license that allowed modifications to be made to the reactor as long as no unreviewed safety question was involved and the reactor would remain within the technical specifications. The amendment to the reactor's license also contained a definition of an unreviewed safety question. This process to allow modifications to be made and this definition of an unreviewed safety question were codified in Title 10 of the Code of Federal Regulations (10 CFR 50.59).

The process that currently exists in the nuclear power industry is essentially the same as that developed in the late 1950s and early 1960s. The holder of a license to operate a nuclear reactor may make changes to the facility (including facility procedures) or perform tests or experiments not described in the authorization basis for the facility without prior approval from their regulator (now the Nuclear Regulatory Commission) if the change could not involve an unreviewed safety question and if no change is required to a technical specification. If a change, test, or experiment could involve either an unreviewed safety question or change to a technical specification, then the Nuclear Regulatory Commission (NRC) must approve before the change, test, or experiment can be physically implemented at the reactor. The process to determine if a change, test, or experiment could involve an unreviewed safety question is documented in the USQD. Yearly summaries of each change, test, or experiment performed in accordance with the USQD process are submitted to the NRC for their information. A change that could result in a USQ is one that:

1. could increase the probability of occurrence or consequences of an accident or malfunction of equipment important-to-safety previously evaluated in the authorization basis,

2. could create the possibility for an accident or malfunction of a different type than any previously evaluated in the authorization basis, or

3. could reduce the margin of safety as defined in the basis for any TSR.

The process described in this document is similar to the process currently used in the nuclear power industry.

1.3 PROCESS SUMMARY

This USQD Application Guide concentrates on the process for performing a USQD. As is shown in Fig. 3.1, of ref. 2, DOE has chosen to delegate Energy Systems the authority to review and implement changes that involve a USQ to most generally accepted and low hazard class facilities. There are exceptions to this delegation. For facilities for which DOE has reserved approval of safety documentation, such as the Toxic Substances Control Act Incineration Facility, all changes involving a USQ would have to be sent to DOE for review and approval. Specifying the overall change process of which the USQD is a part and the Energy Systems safety review that would be performed in lieu of the DOE safety review is outside the scope of this document. Fig. 3.1, of ref. 2, provides context as to how USQDs fit into the larger change process. This Energy Systems change process and safety review should be specified by the site procedures implementing the USQD process.

One purpose of the USQD process is to guide Energy Systems as changes are made to a facility. Changes include physical changes, procedural changes, special tests, and experiments. Changes that result in modifications to Technical Safety Requirements* (TSRs) must be reviewed and approved by DOE before implementation. Energy Systems may make changes to a facility without prior review and approval by the original approving body for safety consequences if that change would not involve an unreviewed safety question (USQ). To determine if the change could result in the facility being outside its authorization basis, the potential effects of the change on the facility authorization basis are determined, as described below. The authorization basis consists of those aspects of the facility design basis relied upon by DOE or Energy Systems to authorize operation of the facility. The authorization basis and other terms are defined in Definitions and Acronyms. Typically the authorization basis would be expected to include (if they exist) the facility Safety Analysis Report, Safety Study, Safety Assessment, Technical Safety Requirements (or Operational Safety Requirements), DOE-issued safety evaluation reports (sometimes generated to document DOE's basis for approving a Safety Analysis Report), any approved SAR Update Program documents for the facility, Risk Assessments, Facility Safety Evaluations and any facility-specific commitments made to comply with DOE orders or policies. The USQD process does not affect or take the place of any other reviews and approvals, e.g., DOE budgetary reviews. DOE has also

*TSR is a relatively new term which includes technical specifications for nuclear reactors and operational safety requirements (OSRs) for non-reactor facilities.

delegated to Energy Systems the authority to approve (for safety consequences) changes to facilities as long as the change could not result in the facility being outside its authorization basis. The facility safety documentation would be revised to include changes made under the USQD process in the normal periodic update.

The delegation of this authority is a significant act of trust by DOE in Energy Systems. It is important that Energy Systems perform USQDs thoroughly and thoughtfully and that the documentation generated in the USQD process demonstrates this.

In addition to evaluating changes to the facilities, it may be required to perform evaluations to determine if as-found conditions were USQs, i.e., could have resulted in the facility being outside its authorization basis. An as-found condition exists when some attribute of an element of a facility is found to be different from what was expected. As an example, an as-found condition could be a valve in a process that was thought to fail closed on loss of motive power but is found to fail open. Another example of an as-found condition could be a ventilation system damper that is found to close more slowly than was assumed. If the damper closes to limit the release of radioactive material after an accident, then the longer closing time could increase off-site radiation doses. This potential increase should be evaluated to determine if it results in the facility being outside its authorization basis.

It is expected that the USQD process will be invoked by other documents and procedures. For example, safety assessments done on changes to existing facilities and the addition of new facilities will contain USQDs. Also, evaluations of discrepancies between the as-found facility condition and the authorization basis will include USQDs. The document invoking the USQD process will control the format for the USQD.

When Energy Systems facilities fully implement configuration management, changes proposed for the facility will be reviewed and approved by a change control board. The USQD will provide valuable input to the board in understanding the extent of the proposed change and whether or not the proposed change should be authorized. In addition to providing input to the change control board, the USQD process will provide input to the categorization of occurrences that are potentially reportable to DOE under DOE Order 5000.3A, Occurrence Reporting and Processing of Operations Information.

As described in detail in Sect. 2.1 and illustrated in Fig. 2.1, the USQD process consists of six straightforward steps:

1. define the change being evaluated,
2. determine the potential effects of the change on the facility,
3. compare these potential effects to the authorization basis for the facility,
4. determine if the potential effects of the change could result in the facility being outside its authorization basis,
5. document conclusions and the process used, and

6. submit for review and approval.

The implementation and documentation of the USQD process are described in detail in Chapter 2.

2. IMPLEMENTATION GUIDELINES

DOE has delegated to Energy Systems the authority to make changes to a facility without DOE's prior review and approval for safety consequences, if that change would not involve a USQ and if no changes to the TSRs are required. DOE has also delegated Energy Systems the authority to approve all changes to most facilities that have hazard classes of "Low" or "Generally Accepted" whether or not the change involves a USQ. See Sect. 1.3 for a discussion of exceptions to this delegation. If a change to a "Low" or "Generally Accepted" facility raised its hazard class to "Moderate" or "High" DOE would have to approve that change. If the change to a facility for which DOE has not delegated Energy Systems the authority to approve all changes could involve a USQ, the change must be submitted to DOE for review and approval before the change can be physically implemented.

A USQ is a change or as-found condition that could result in the facility being outside its authorization basis. A facility's authorization basis consists of the aspects of the facility's design (including procedures) which the original approving body relied upon to authorize operation. All changes to TSRs require review and approval by DOE before implementation. Therefore, any change that would require a TSR revision, whether or not it could involve a USQ, must receive DOE review and approval before the change is implemented. DOE may also require Energy Systems to evaluate as-found conditions to determine if the as-found condition could have resulted in a USQ. This application guide will describe the process for determining if a change or as-found condition could result in a USQ.

For example, consider a hot cell that handles radioactive material that can become airborne. The facility design includes two filters in series to reduce the amount of radioactive material that can be released to the atmosphere in an accident. Removal of one or both of these filters could result in an increased release of the radioactive material to the atmosphere in an accident. Therefore, removal of one or both filters would increase the accident consequences and would likely be a USQ. This change would require review and approval by the original approving body prior to its implementation. Although this example is quite simple, care must be taken to ensure that all changes or as-found conditions are well understood and that all potential effects of the changes or as-found conditions are known and considered. The following sections give guidance for performing and documenting the determination of whether or not a change or as-found condition could result in a USQ (i.e., performing an unreviewed safety question determination, USQD).

When the term "change" is used in this document, it includes modifications, experiments, procedural changes, as-found conditions, special tests, and temporary changes unless otherwise indicated. An as-found condition is a discrepancy between the performance or some other attribute of an element of a facility and an assumption about that facility element. In Sect. 1.3 examples of as-found conditions were given. One of the previous examples was a valve thought to fail closed on loss of motive power that actually fails open. The other example was a ventilation system damper that was found to close more slowly than was assumed in the safety analysis.

2.1 PROCESS

The process for performing a USQD is shown in Fig. 2.1. To ascertain if a change could result in a USQ, define the change being evaluated, determine the potential effects of the change on the facility, compare these potential effects to the authorization basis for the facility, determine if the potential effects of the change could result in the facility being outside its authorization basis, and document the conclusions and the technical basis for those conclusions. The documentation must be such that another technically qualified individual, who is not familiar with the facility or change, can understand that the USQD is complete, assumptions are valid, and the conclusion is appropriate without recourse to the preparer. It is expected that USQDs will be reviewed, audited, or both, by an independent safety organization such as the Installation Facility Safety Manager.

The USQD should be completed before the physical implementation (e.g., start of construction) of the proposed change. For changes to procedures, the USQD should be complete before the revised procedure is used. The USQD should be performed as early in the design process as possible, consistent with having adequate design information to perform the USQD. If a proposed change is determined to be a USQ, design work, including procurement, may proceed (at risk) with the documented agreement of management from Energy Systems and the funding organization within DOE. Similarly, a change that is a USQ may be subdivided into parts and the parts re-evaluated. Any part that is not a USQ may be implemented (at risk) with the documented agreement of management from Energy Systems and the funding organization within DOE.

For facilities placed under configuration management, the USQD will provide valuable input to the change control board. The USQD will assist the change control board in understanding the potential impacts on safety of the proposed change.

2.1.1 Define the Change

The first step is to define the change being evaluated. Although this may sound simple, it is a crucial step, and one that, frequently, is not adequately performed. To define the change, the actual modification being proposed, including the process of accomplishing the modification with associated intermediate steps, must be understood and evaluated. Major equipment being added or deleted should be considered as well as interfaces between added equipment and the remaining equipment, changes to interlocks, changes in control mechanisms, changes in material inventory, changes to operating procedures, and new processes or materials. Consider, for example, the addition of a second filter to a system that exhausts air from a hot cell. The change could include disabling the existing exhaust system, breaching the associated ductwork, adding a new exhaust fan, and adding new ductwork to the existing exhaust system.

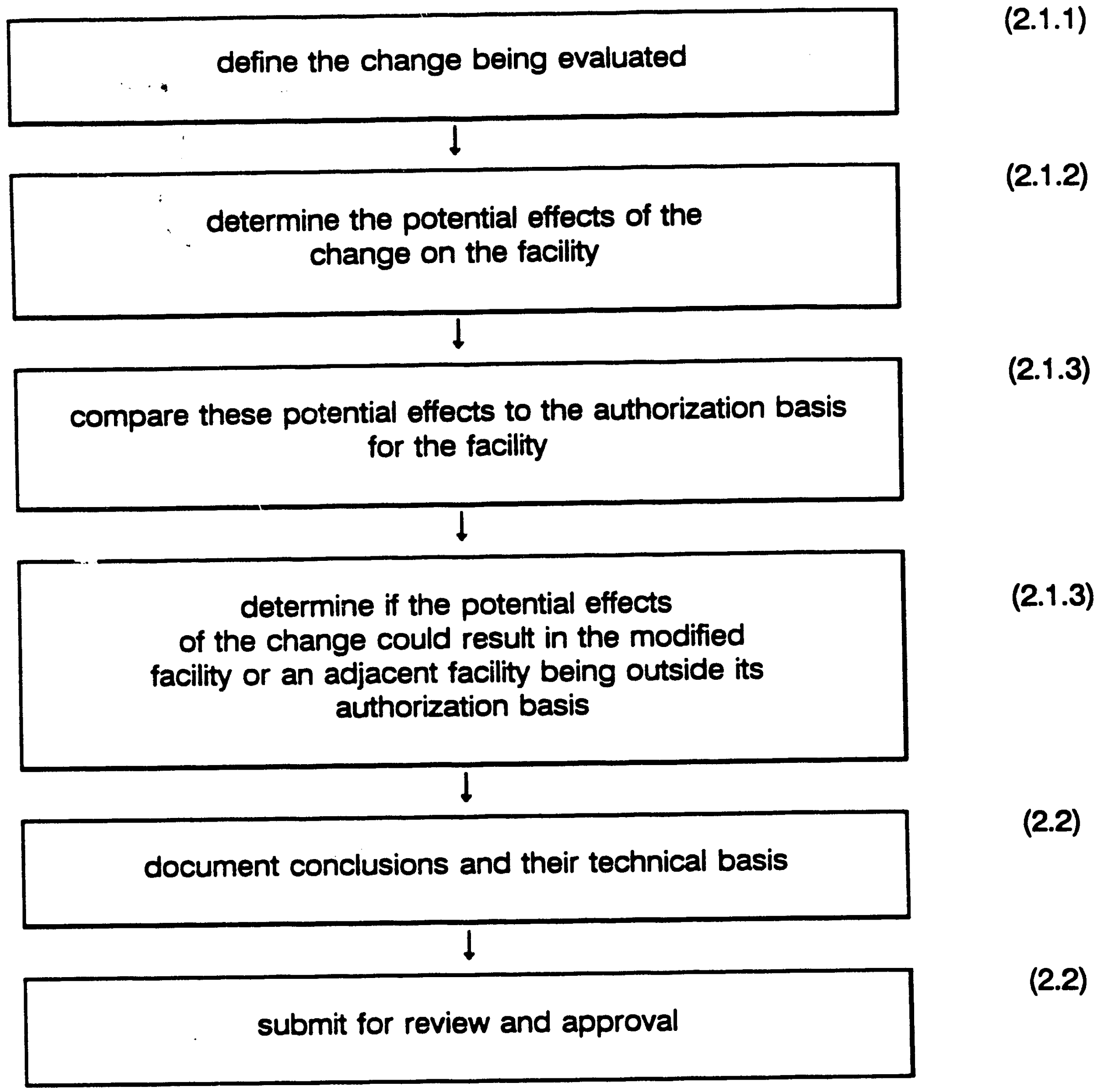


Fig. 2.1. USQD Process.

2.1.2 Determine the Potential Effects of the Change on the Facility

The second step is to determine the potential effects of the change on the facility. Indirect and unintended effects must be considered in the evaluation. The intent of this step is to determine how the change impacts the facility's systems and components. The effects of intermediate configurations on the facility must also be considered. For example, the installation of a new filter in a system that exhausts air from a hot cell could affect the pressure drops in the system, electrical loadings if another fan or damper is being added, radiation levels resulting from the location of the new filter, the hot cell exhaust system being unavailable during modification, and unrelated equipment near the modification possibly being placed in jeopardy during the modification. All of the potential effects from the modification must be considered.

2.1.3 Compare the Potential Effects of the Change to the Authorization Basis for the Facility

This comparison is performed by answering three complex questions. An answer of "yes" to any question results in the change being declared a USQ. The three questions are:

1. Could the probability of occurrence or the consequences of an accident or malfunction of equipment important-to-safety previously evaluated in the authorization basis be increased?

2. Could the possibility for an accident or malfunction of a different type than any evaluated previously in the authorization basis be created?

3. Could the margin of safety as defined in the basis for any TSR be reduced?

In questions 1 and 2, "safety analysis report" in the version of these questions as promulgated by the NRC has been replaced by "authorization basis". This change was made because some DOE facilities do not have approved, current safety analysis reports. Furthermore, for some DOE facilities, safety analysis reports are not required. Authorization basis was discussed in Sect. 1.1 and is defined in Definitions and Acronyms. For the purpose of answering the three complex questions, they can be subdivided into seven separate questions:

1. Could the change increase the probability of occurrence of an accident previously evaluated in the authorization basis?

2. Could the change increase the consequences of an accident previously evaluated in the authorization basis?

3. Could the change increase the probability of occurrence of a malfunction of equipment important-to-safety previously evaluated in the authorization basis?

4. Could the change increase the consequences of a malfunction of equipment important-to-safety previously evaluated in the authorization basis?

5. Could the change create the possibility of an accident of a different type than any previously evaluated in the authorization basis?

6. Could the change create the possibility of a malfunction of equipment important-to-safety of a different type than any previously evaluated in the authorization basis?

7. Could the change reduce the margin of safety as defined in the basis for any TSR?

The process of answering each of these seven questions will be discussed below. The discussion provided on answering the questions is general in nature. The discussion is provided to provoke thinking. Obviously, there will be some evaluations that involve unique changes; therefore, guidelines that can be considered as a total checklist cannot be provided.

2.1.3.1 Could the Change Increase the Probability of Occurrence of an Accident Previously Evaluated in the Authorization Basis?

To understand how the probability of occurrence of an accident could be increased, one must first understand how the term "accident" is applied. The term "accidents" refers to anticipated operational transients and postulated design basis accidents considered to have a probability of occurrence sufficiently large to warrant inclusion in the safety analysis report (SAR) or other authorization basis documents.

Normally, the determination of a probability increase at this point is based on a qualitative assessment. However, if a facility-specific probability calculation is available and can be used to evaluate a change in a quantitative sense, it should be used when there is minimal uncertainty. Probabilistic Risk Assessments (PRAs) constitute just one tool used to evaluate safety and PRA use is not necessarily needed to perform USQDs.

In performing an evaluation of whether or not the change could make an accident more likely, the following are examples of questions that should be considered.

1. Will the change meet the design, material, and construction standards applicable to the system or equipment being modified? If the answer is "yes", this aspect of the change is judged not to increase the likelihood of an accident. The addition of properly designed and constructed piping to a facility would not be considered to increase the probability of a pipe-break accident. However, a large extension of a marginally-designed facility could significantly increase the likelihood of some accidents. If the answer is "no" to any of the items, either a justification for saying there is no increase in the likelihood of the accident occurring will need to be developed, or it must be concluded that the likelihood of the accident occurring is increased. With either a "yes" or "no" answer, the questions in Item 2 must be addressed.

2. Will the change affect overall system performance in a manner that could increase the probability of an accident? Examples of questions to ask are:

   a. Will the change use instrumentation with accuracies or response characteristics that are different than existing instrumentation such that an accident is more likely to occur?

   b. Will the change cause systems to be operated outside of their design or testing limits? Examples include imposing additional loads on electrical systems, operating a piping system at higher than normal pressure, and operating a motor outside of its rated voltage and amperage.

   c. Will the change cause system vibration or water hammer, fatigue, corrosion, thermal cycling, or degradation of the environment for equipment important-to-safety that would exceed the design limits?

   d. Will the change result in a modification to any system interface in a way that would increase the likelihood of an accident?

   e. Will the change reduce system reliability or availability?

The next section addresses potential increases in the consequences of previously analyzed accidents that could result from the change.

2.1.3.2 Could the Change Increase the Consequences of an Accident Previously Evaluated in the Authorization Basis?

The consequences of interest are exposure of people to hazardous materials, energy (e.g., radiation, fire, explosion), or both. Changes that have an adverse effect, but do not increase the exposure of people to hazardous materials, energy, or both, should be primarily addressed in the last of the seven questions and not here. See Sect. 2.1.3.7.

In answering this question, the first step is to determine which accidents evaluated in the authorization basis may have their energy and hazardous material consequences altered as a direct result of the change. The next step is to determine whether the change does, in fact, increase the consequences of any of the accidents evaluated in the authorization basis. Examples of questions that assist in this determination are as follows:

1. Will the change alter, degrade, or prevent mitigative actions described or assumed in the authorization basis?

2. Will the change alter any assumptions previously made in evaluating the consequences in the authorization basis?

3. Will the change impact the mitigation of the energy or hazardous material consequences in the authorization basis?

4. Will the change affect any fission product, energy release, or hazardous material barriers?

If it is determined that the change does have an effect on the consequences of any accident analysis previously described in the authorization basis, then either:

1. Demonstrate and document that the safety consequence of the accident described in the authorization basis are bounding for the change (i.e., by showing that the consequences of the previous analyses bound those that would be associated with the change); or

2. Revise and document the analysis, taking into account the change and compare the consequences to the acceptance limits in the prior analyses. Any administrative limits or changes put in place to compensate for the other elements of the change should be listed.

In evaluating the potential for increased consequences from an accident and a malfunction of equipment important-to-safety in Sect. 2.1.3.4, the effects on and from adjacent facilities should be considered. For example, putting an office building adjacent to a facility that could release energy or hazardous materials could increase the consequences since more people would be exposed.

2.1.3.3 Could the Change Increase the Probability of Occurrence of a Malfunction of Equipment Important-to-Safety Previously Evaluated in the Authorization Basis?

In answering this question, the first step is to determine what important-to-safety (ITS) equipment could be impacted by the change. Typically, ITS equipment could be any component that is directly or indirectly relied upon to reduce the likelihood or consequences of an accident. Then the effects of this change on ITS equipment are evaluated. This evaluation shouid include both direct and indirect effects. Direct effects are those where the change affects the ITS equipment (e.g., a motor change on a pump). Indirect effects are those in which the change impacts another piece of equipment, and this piece of equipment affects the ITS equipment. Generally, ITS is not a defined set of equipment. The authorization basis must be studied to determine what the ITS equipment is for a specific facility.

After identifying the impact of the change on the ITS equipment, a determination is made if an increase in the probability of a malfunction of the ITS equipment could result. The following are examples of questions that can be used in making the determination.

1. Will the change meet the original design specifications for materials and construction practices when the following questions are considered:

a. Are the seismic specifications met (e.g., use of proper supports, proper lugs at terminals, and isolation of lifted leads)?

b. Are separation criteria met (e.g., minimum distance between circuits in separate divisions, channels in the same division, and jumper cables run in conduit)?

c. Are the environmental qualification criteria met (e.g., use of materials qualified for the radiation or thermal environment in which they will be used)?

2. Will the change degrade structure, system, or component reliability by;

   a. Imposing additional loads not analyzed in the original design?

   b. Deleting or modifying system or equipment protection features?

   c. Downgrading the support system performance necessary for reliable operation of the ITS equipment?

   d. Reducing system or equipment redundancy or independence?

   e. Significantly increasing the frequency of operation of ITS systems or equipment?

   f. Altering testing requirements on ITS systems or equipment?

   g. Decreasing the availability of the systems or equipment?

If the answer to any of the questions in Item 2 above is "yes", more evaluation will probably be required. While this section addressed the potential for a change to increase the probability of a malfunction of equipment important-to-safety, the next section addresses potential increases in consequences.

2.1.3.4 Could the Change Increase the Consequences of a Malfunction of Equipment Important-to-Safety Previously Evaluated in the Authorization Basis?

As in Sect. 2.1.3.2, the consequences of interest are exposure of people to hazardous materials, energy, or both. Changes that have a negative effect, but do not increase the exposure of people to hazardous materials or energy, should primarily be addressed in the last of the seven questions. See Sect. 2.1.3.7.

In answering this question, assume a malfunction of ITS equipment, and determine if the change could result in an increased exposure of people to hazardous materials, energy, or both.

For example, consider a change such that a valve is now designed to fail in the closed position where previously it was designed to fail in the open position. If failing the valve in the closed position results in an increase in the consequences of an accident, then this is a change that increases the consequence of a malfunction of equipment important-to-safety and is, therefore, a USQ.

2.1.3.5 Could the Change Create the Possibility of an Accident of a Different Type than any Previously Evaluated in the Authorization Basis?

An accident or malfunction that involves an initiator or failure not considered in the facility authorization basis is potentially an accident or malfunction of a different type. An example could be turbine missiles from a gas turbine added as an alternate power source. Certain accidents or malfunctions are not treated in the facility authorization basis because their effects are bounded by other related events that are analyzed. For example, a postulated pipe break in a small line may not be evaluated within the authorization basis of the facility because it has been determined to be less limiting than a pipe break in a larger line within the same area. Therefore, if a proposed design change would introduce a small, high-energy line break into an area that already had a pipe break from a larger high-energy line analyzed for energy release and pipe whip, postulated breaks in the smaller line should generally not be considered an accident or malfunction of a different type. There are unusual scenarios in which the smaller line break would have to be considered to see if an accident or malfunction of a different type could result. For example, if the smaller line was a part of a system which was disabled by the break and the energy release from the break disabled a redundant system, a different type accident could be created than if the system containing the smaller line was not disabled by the pipe break.

The possible malfunctions or accidents of a different type are limited to those that are considered in the authorization basis. That is, malfunctions and accidents not considered in the authorization basis because their probability of occurrence is too small would not be postulated in the USQD. For example, a seismic-induced failure of a component that has been designed to the appropriate seismic criteria will not be considered to cause a malfunction of a different type. However, a change that increases the probability of an unanalyzed accident to the point where it becomes as likely as the accidents considered in the authorization basis, creates a possible accident of a different type. The next section addresses the potential for the change to create the possibility for a different type of malfunction of equipment important-to-safety than any previously evaluated.

2.1.3.6 Could the Change Create the Possibility of a Malfunction of Equipment Important-to-Safety of a Different Type than any Previously Evaluated in the Authorization Basis?

This question asks whether the change could lead to a failure mode of a different type than those evaluated in the authorization basis. The types of failure modes that this change could create are compared to the types of failure modes of ITS equipment that have previously been evaluated in the authorization basis to determine if any new failure types would be created. An example that might create a malfunction of a different type could be the relocation of equipment so that it now becomes susceptible to flooding. Another might be replacement of a mechanical control system on equipment important-to-safety with an electronic control system that can potentially fail in a different mode. A third example could be replacement of a centrifugal pump with an air driven diaphragm pump which could fail in such a way as to atomize the pumped liquid through the pump exhaust.

2.1.3.7 Could the change Reduce the Margin of Safety as Defined in the Basis for any TSR?

The TSRs (also known as Operational Safety Requirements) set forth the minimum acceptable limits for operation under normal and specified failure conditions. TSRs ensure that the available equipment and initial conditions meet the assumptions in the accident analyses. This helps to ensure that the plant operates in a manner that will provide adequate protection for the health and safety of the public. TSRs are a distillation of those aspects of the authorization basis that are required in order to ensure the performance of systems, structures, components, and personnel as relied upon in the authorization basis. The bases of the TSRs should define the acceptance limits from which margins of safety may be determined. The relationship between acceptance limits and the margin of safety is shown in Fig. 2.2, and is discussed below.

For example, consider a piping system containing hazardous material. These numbers are for illustration purposes, only. The piping system is designed to the applicable piping codes with a design pressure of 100 psig. The system operating point is established at 80 psig. A change would not be a USQ as long as the analysis considering the change did not reduce the margin of safety. The actual wording of the TSR bases is crucial in making this determination. Assume the TSR says a certain transient would result in a peak pressure of 93 psig. If the change could increase the peak pressure for the same transient to 97 psig, that would be a reduction in margin and a USQ. However, if the TSR bases said all transients would have a peak pressure less than 98 psig, the same change would not be a USQ. In the absence of specific wording in the TSR bases, the limit would be 100 psig. If no other value was specified, the margin of safety would not be reduced until 100 psig was exceeded.

To the maximum extent practicable, the bases for a TSR should explicitly define or address the margin of safety. If the bases do not specifically address a margin of safety, then the safety analyses and other appropriate authorization basis documents should be reviewed to determine if the change would result in a reduction in a margin of safety. The margin may be implicit rather than being explicitly expressed as a numerical value. Therefore, the precise determination of a numerical value associated with a change is not always required. Implicit margins are, for example, conditions for acceptance for a computer code, method, or industry accepted practice. An example of an implicit margin in an industry accepted practice would be the method used to combine stresses in the design of a component. An example of an implicit margin in a computer code could be the use of a specific algorithm for a portion of the computer code calculations. It may be sufficient to determine only the direction of the margin change (i.e., increasing or decreasing). If the margin is reduced, the change will involve a USQ.

A change in initial conditions, or in a system response time, or in some other parameter affecting the course of an accident analysis supporting the bases of the TSRs must be evaluated to determine if the change causes the acceptance limit for that analysis to be exceeded. If the limit is exceeded, the change would involve a reduction in the margin of safety.

The determination of whether or not a reduction in margin is involved is based on the results of the analysis and not on the change itself. For example, an increase in initial conditions (not already limited by TSR's) in the nonconservative direction can be compensated for by lowering a setpoint or reallocating analysis conservatisms. If the analysis results continue to be bounded by the acceptance limit, a reduction of margin is not involved.

2.2 USQD DOCUMENTATION

The USQD must be documented such that it is auditable by DOE and others. The documentation must be in sufficient detail such that an independent reviewer could understand the basis for the conclusions reached as to whether or not a change is a USQ. Merely answering the USQD questions "yes" or "no" is not adequate. Reversing the word order of a question such that it becomes a simple statement of conclusion rather than an explanation is also not acceptable by itself. However, such a statement may be used as a concluding, summary statement if it is suitably augmented with additional information.

The importance of the documentation is emphasized by the fact that often experience and engineering knowledge, rather than models and experimental data, are relied upon in making the determination. Since important goals of the USQD are completeness, demonstration that the safety basis is being maintained, and capability to be audited by DOE, the items considered must be clearly stated. The safety evaluation is the essence of the USQD. The safety evaluation is a critical evaluation of the change against the authorization basis. The safety evaluation should consider the following questions:

1. What systems and components are affected and how were they affected?

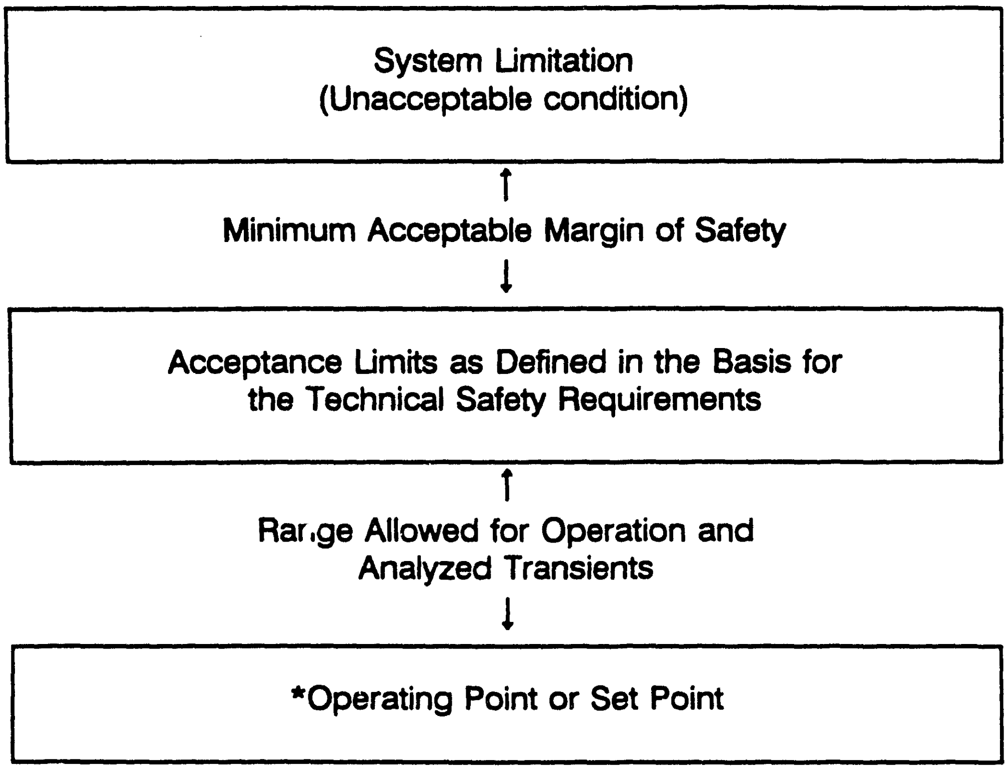
2. What parameters of the accident analysis are affected and how did they change?

3. What design basis accidents were reviewed for impact and how were they impacted?

4. What failure modes were considered?

5. What was the original design basis of the structures, systems, and components affected?

6. What effect did the issue have on margin of safety as defined in TSRs or safety analyses?



*May be re-allocated without approval using consistent methods if all parameters remain within approved limits, do not reduce the margin of safety, and meet current, approved TSRs.

Fig. 2.2. Relationship of Limits, Operating Points and Margin of Safety.

The USQD shall document how the evaluation led to the conclusion for each question by considering the effects enumerated above. USQDs may be performed as a part of different programs (e.g., as a part of safety assessments for new and modified facilities or to evaluate as-found conditions). The program under which the USQD is performed will control the format of the USQD. For example, if a USQD is performed as a part of a safety assessment on a change to a facility, then the document that controls the safety assessment format will also control the details of the USQD format.

Even though the program under which the USQD is performed will control the specific format of the USQD, general guidance may be given. See Fig. 2.3 for an outline of the USQD documentation. If the USQD is a part of another document such as a safety assessment, all sections of the USQD must be included but can be arranged according to the format of the document in which the USQD is contained. It is expected that, in general, more discussion will be provided for the more complex changes to the more hazardous facilities.

An Introduction section should be provided that describes the change and its expected effects. The structures, systems, and components affected by the change should be briefly identified. The significance of the change to facility safety should be described and sources of information cited.

A safety evaluation section addressing four major themes should be provided. The safety evaluation discussion should explicitly address the impact of the change on accidents and malfunctions considered in the authorization basis, the change's potential to create an accident or malfunction of equipment important-to-safety of a different type than any evaluated in the authorization basis, the change's potential impact on the margin of safety, and a clear statement as to whether or not the change is a USQ. In addition to defining the change to be evaluated, the authorization basis must be identified. Parts I, II, and III contain the original questions posed in Sect. 2.1.3. Parts IV and V contain the conclusion and any special assumptions or requirements resulting from the safety evaluation. Suggestions of points that should be addressed in the safety evaluation follow.

Introduction

Safety Evaluation

Part I: **Impact on the Accidents and Malfunctions Considered in the Authorization Basis**

Part II: **Potential for Creation of a New Type of Unanalyzed Event**

Part III: **Impact on the Margin of Safety**

Part IV: **Safety Evaluation Conclusions**

Part V: **Special Requirements**

Fig. 2.3. An outline of the USQD documentation.

PART I: IMPACT ON THE ACCIDENTS AND MALFUNCTIONS CONSIDERED IN THE AUTHORIZATION BASIS.

When addressing the impact of the change on accidents and malfunctions considered in the authorization basis, the following points should be included.

1. Identify the design basis accidents reviewed for potential impact by the change.

2. Discuss how the parameters and systems, affected by the change, impact the consequences of these accidents.

3. Identify the design basis accidents, if any, for which failure modes associated with the change can be a contributing or an initiating event.

4. Discuss the impact of the change on the probability of occurrence of the design basis accidents identified in 3.

5. Identify the safety systems and systems important-to-safety affected by the change.

6. Discuss the impact of the change and/or the failure modes associated with the change on the probability of failure of the systems identified.

7. Discuss the impact of the change on the performance of the affected systems.

Based on the discussion addressing the above points, the following questions must be answered.

	Yes	No
• Based upon 2, does the change increase the consequences of a design basis accident?	____	____
• Based upon 4, does the change increase the probability of a design basis accident?	____	____

	Yes	No
• Based upon 6, does the change increase the probability of a malfunction of equipment important-to-safety evaluated in the authorization basis?	____	____
• Based upon 7, does the change degrade the performance, i.e., increase the consequences of a malfunction of equipment important to safety evaluated in the authorization basis?	____	____

If any of the above are answered yes, the change is an unreviewed safety question.

PART II: POTENTIAL FOR CREATION OF A NEW TYPE OF UNANALYZED EVENT

The following points should be included when addressing the change's potential to create an accident or malfunction of equipment important-to-safety of a different type than any evaluated in the authorization basis.

1. Based upon Part I, assess the impact of the change and/or failure modes associated with the change, to determine if the impact has modified the facility response to the point where it can be considered a new type of accident. Discuss the basis for this determination.

2. Determine if the failure modes of equipment important-to-safety associated with the change represent a new unanalyzed type of malfunction. Discuss the basis for this determination.

3. Determine if the change, or a failure mode associated with the change, increases the probability of an accident to the point where it should be considered within the design basis.

The following question is answered based on the preceding discussion.

	Yes	No
Based upon 1, 2, and 3 does the change create the potential for a new type of unanalyzed accident or a new type of malfunction?	____	____

If the answer is yes, the issue represents an unreviewed safety question.

PART III: IMPACT ON THE MARGIN OF SAFETY

Address the following points when assessing the change's potential impact on the margin of safety.

1. Based on the results identified in the discussion of the change's impact on previously analyzed accidents and malfunctions, discuss the impact of the consequences on the protective boundaries.

2. Identify how the protective boundaries, if any, are directly affected by the change or a failure mode of the change.

3. Discuss the impact of the change on the acceptance limits for the protective boundaries identified above.

4. Identify the margins of safety, related to this change that are defined in the bases of Technical Safety Requirements.

Based on the discussion addressing the above points, answer the following questions.

	Yes	No
1. Based upon 1, do the consequences of the design basis accidents exceed the limits for an acceptable change?	____	____
2. Based upon 2, 3 and 4 does the change reduce the margin of safety provided for the protection boundaries?	____	____
3. Based upon 4, does the change reduce other margins of safety in the bases for the Technical Safety Requirements that are not related to the boundaries?	____	____

If any of the above is answered yes, the change is a USQ.

PART IV: SAFETY EVALUATION CONCLUSIONS

To summarize the evaluation, the following statement should be completed.

Based upon the safety evaluation the change

_____ does not constitute an unreviewed safety question.

_____ does constitute an unreviewed safety question

If the change does constitute an unreviewed safety question, the change cannot be physically implemented without prior approval by the original approving body.

PART V: SPECIAL REQUIREMENTS

List the assumptions upon which the conclusions of the USQD are based. If an assumption is not met, the USQD is invalidated. Special requirements can include interim configuration limitations during a modification. For example, a special requirement could prohibit handling of radioactive powders while a hot cell exhaust system was unavailable due to modifications.

A blank USQD form is given in Appendix B. Spacing between the lines should be adjusted as needed.

REFERENCES

1. ES/CSET-1, Revision 2, *Safety Analysis Report Update Program, Overview and Phase I Implementation*, August 1991.

2. CSET-8, *Safety Analysis Report Update Program, Supplemental Configuration Management Guidance*, June 1991.

3. DOE/OR-901, Revision 1, *Guidance for Preparation of Safety Analysis Reports*, December 1990.

APPENDIX A

HOT CELL EXHAUST EXAMPLE

PRELIMINARY MATERIAL — NOT A PART OF THE EXAMPLE USQD DOCUMENTATION

The change to be evaluated is to add an additional exhaust fan and filter to the ventilation system that maintains a hot cell at a negative pressure with respect to the atmosphere. The ventilation system currently consists of one exhaust fan and filter. The existing exhaust fan and filter cannot maintain the hot cell at a sufficiently negative pressure. It has been determined that the ventilation system should have a second fan and filter added to it.

Define the Change (See Sect. 2.1.1 of this guide)

The change is to add an exhaust fan and filter to a ventilation system in parallel with an existing exhaust fan and filter. To accomplish this addition, the existing ductwork will have to be cut to allow the ductwork associated with the new fan and filter to be welded in. The new fan, filter, and ductwork will be of the same materials and designed to the same codes and standards as the existing ductwork. The new fans, filters, and ductwork will have the same capacities as the existing components. The new fan and filter will be supplied from the same manufacturer and be the same model as the existing components. The new fan will be powered from the same electrical distribution board as the existing fan. Backdraft dampers are provided with the new and existing fans.

Determine the Potential Effects of the Change on the Facility (See Sect. 2.1.2 of this guide)

The potential effects of this change on the facility are to increase the flow rate out of the hot cell, to decrease the pressure within the hot cell, and to possibly increase the off-site doses. The magnitude of the changes in pressure and doses needs to be determined or bounded. The ability of the hot cell and ductwork to withstand the increased negative pressure should be demonstrated. The addition of the exhaust fan will increase the loading on the electrical distribution board. The addition of the exhaust fan would result in an increased thermal loading in the room that contains the fans and filters. The added components may also increase the radiation levels from the radioactive materials flowing through, and having been deposited on, the components.

The material on this page is not a part of the USQD documentation. It has been included to illustrate the thought process that should be gone through in considering a change. The following material is an example of the suggested format and content of a USQD.

HOT CELL EXHAUST USQD

Introduction

The change being evaluated is the addition of an exhaust fan, filter, and associated ductwork in parallel with the existing fan and filter for hot cell "A" in Building XXXX. The system requirements document indicates that the added components will have capabilities identical to the existing components. The new components will be designed and procured to the same codes, standards, and loadings as the existing components. The new fan and filter will be supplied from the same manufacturer and be the same model as the existing components.

These exhaust fans maintain hot cell"A" at a negative pressure with respect to atmosphere during normal operations and accidents. Keeping hot cell "A" at a negative pressure ensures that any air leakage is into and not out of the hot cell. The filters in the ventilation system will remove most of the radioactive powder that could be released in an accident.

Safety Evaluation

The addition of an exhaust fan, filter, and associated ductwork to hot cell "A" will be evaluated with respect to its effects on the authorization basis in this safety evaluation.

PART I: IMPACT ON THE ACCIDENTS AND MALFUNCTIONS CONSIDERED IN THE ON BASIS

The authorization basis for this facility consists only of the hazard screening document for Building XXXX, HS/XXXX/F/0001/R2.

1. **Identify the design basis accidents reviewed for potential impact by the change.**

The hazard screening document was reviewed to determine which bounding accidents could be impacted by the change. Since the hot cell exhaust system maintains the hot cell at a negative pressure with respect to atmosphere and exhausts air from the hot cell, only accidents that result in radioactive material becoming airborne could be impacted by this change. In the hazard screening document for Building XXXX the bounding accident for radioactive material becoming airborne in hot cell "A" is dropping of a container containing 100 grams of Cs^{137} in powder form. The analysis in the hazard screening document does not take credit for the exhaust system.

2. **Discuss how the parameters and systems, affected by the change, impact the consequences of these accidents.**

The addition of another exhaust fan could increase the exhaust flow rate out of hot cell "A". If a container of Cs^{137} powder were dropped, the powder could become airborne in hot cell "A". Even though the increased exhaust flow is filtered, higher radiation doses to off-site and on-site people could result from the increased flow. These radiation doses are shown on the attached map. The increase in radiation dose is small on-site and off-site, i.e., less than 3%, and well within the acceptance limit given in DOE Order ZZZZ.ZZ. The dose in the immediate vicinity of the hot cell would be reduced by the increased exhaust flow since there would be less air leakage out of the hot cell. In addition, a procedure will be written to direct the operators to monitor and adjust the air flow rate out of the hot cell, if a spill of radioactive material has occurred.

3. **Identify the design basis accidents, if any, for which failure modes associated with the changes can be an initiating event.**

The components being added will be designed and procured to the same codes and standards as the existing components. Handling of powdered radioactive material will be halted while the existing exhaust system is out-of-service for this modification. See special requirement 3. The new fan and filter will be supplied from the same manufacturer and be the same model as the existing components. Therefore, there are no new failure modes associated with the change that can be an initiating event for design basis accidents.

4. **Discuss the impact of the change on the probability of occurrence of the design basis accidents identified in 3.**

In Item 3 there were no design basis accidents identified for which a failure mode associated with the change could be an initiating event.

5. **Identify the safety systems and systems important-to-safety affected by the change.**

Although not explicitly identified in the authorization basis as such, the exhaust system was considered as the system important-to-safety that could be affected by the change. The exhaust system (fans, filter, and ductwork) is required to mitigate the drop of a container of CS^{137} powder. Any equipment located in the same room as the existing and the new exhaust fans, filters and ductwork could be affected by increased room temperature and increased radiation resulting from the new equipment. Calculations were performed in ref. 1 and ref. 2 that demonstrate the added equipment will not increase the room temperature or radiation above the values used for design. Therefore, the only system important-to-safety that could be affected by this change is the exhaust system.

With both fans operating, the ductwork and hot cell "A" structure could be subjected to slightly more negative pressures. The effect of this slight increase in negative pressure on the structure would be negligible. See ref. 3 for the calculations of the negative pressure in the ductwork and the ability of the ductwork to withstand the negative pressure.

6. **Discuss the impact of the change and/or the failure modes associated with the change on the probability of failure of the systems identified.**

The added components will be designed and procured to the same criteria as the existing components and will be functionally identical to them. The presence of backdraft dampers, that are associated with the fans, will prevent any backflow through an inoperative fan.

Reference 3 calculated that the maximum negative pressure that the exhaust ductwork and hot cell "A" structure would see with both fans running would be 1/2 in. of water. Reference 3 also shows that this value is well within the capability of the ductwork and structure to withstand negative pressure.

The plan for accomplishing this modification has not yet been developed. The modification plan must be reviewed and this USQD revised to reflect that review before any physical modification is allowed. Obviously, the existing ductwork will have to be cut in the process of adding these additional components. Section Y.Y.Y. of the Technical Safety Requirements (or Operational Safety Requirements) for Building XXXX requires that handling of powdered radioactive material must stop if the cell exhaust system is inoperative. Therefore, no radioactive material in powdered form may be handled while the existing exhaust system is out-of-service for construction. Otherwise, there will be no increase in the probability of failure of any systems important-to-safety.

7. **Discuss the impact of the change on the performance of the safety systems.**

The completed modification will increase the probability that at least one exhaust fan is operating after a spill of radioactive material in hot cell "A". On-site and off-site doses could be slightly increased but are still well within acceptance limits in DOE Order ZZZZ.ZZ.

The added components will not result in the thermal or radiation environment exceeding that for which any important-to-safety equipment is designed.

The increased negative pressure resulting from the added exhaust fan will be easily withstood by the ductwork and hot cell structure.

Therefore, there are no negative effects on the performance of any safety system resulting from this change.

	Yes	No
Based upon 2, does the change increase the consequences of a design accident?	___	X
Based upon 4, does the change increase the probability of a design basis accident?	___	X
Based upon 6, does the change increase the probability of a malfunction of equipment important-to-safety evaluated in the authorization basis?	___	X
Based upon 7, does the change degrade the performance, i.e., increase the consequences of a malfunction, of equipment important to safety evaluated in the authorization basis?	___	X

If any of the above is answered yes, the change is a USQ.

PART II: POTENTIAL FOR CREATION OF A NEW TYPE OF UNANALYZED EVENT

1. **Based upon Part I, assess the impact of the change and/or failure modes associated with the change, to determine if the change has modified the facility response to the point where it can be considered a new type accident. Discuss the basis for this determination.**

The addition of an exhaust fan, filter, and associated ductwork will not change the response of the facility to the point where it can be considered a new type accident. The only effects of the modification are to increase the flow rate of air being exhausted from the hot cell. Part I addressed the potential for increased on-site and off-site radiation doses, increased radiation dose rate and increased thermal loading in the room that contains the new and existing exhaust equipment, and increased negative pressure in the hot cell and exhaust ductwork. All of these potential problems were shown not to cause the facility to exceed its design basis.

Item 6 of Part 1 points out that handling of radioactive powders will have to be stopped when the existing exhaust system is out-of-service for construction during this modification.

2. **Determine if the failure modes of equipment important-to-safety associated with the change represent a new unanalyzed type of malfunction. Discuss the basis for this determination.**

The equipment to be added is functionally identical to the existing equipment. No new type of malfunction is introduced.

3. **Determine if the change, or a failure mode associated with the change increases the probability of an accident to the point where it should be considered within the design basis.**

The components being added are designed and procured to the same requirement as the existing components. No new failure modes are created. No equipment important-to-safety will be negatively affected by this change. As noted in Item 6 of Part I, the modification plan must be reviewed and this USQD revised to reflect that review before any physical modification is allowed.

	Yes	No
Based upon 1, 2, and 3 does the change create the potential for a new type of unanalyzed accident or a new type of malfunction?	___	X

If the answer is yes, the change is an unreviewed safety question.

PART III: IMPACT ON THE MARGIN OF SAFETY

1. **Based on the results identified in the discussion on the change's impact on previously analyzed accident and malfunctions, discuss the impact of the consequences on the protective boundaries.**

Item 2 of Part I indicates this change could slightly increase the on-site and off-site dose but that this increase is well within the acceptance limit.

Item 5 of Part I indicates that the added components will not negatively affect other components important-to-safety and that the ductwork and hot cell structure will withstand the slightly increased negative pressure.

Item 6 of Part I indicates that there will be no increase in the probability of failure of any system important-to-safety resulting from this modification.

Item 7 of Part I indicates the change will not result in negative effects on the performance of any safety system.

2. **Identify how the protective boundaries, if any, are directly affected by the change or a failure mode of the change.**

As discussed above, the change will not negatively affect the hot cell structure or the ductwork. Handling of powdered radioactive material will be stopped while the existing ductwork is compromised during this modification. The added components will be designed and procured to the same criteria as the existing components. The new components will be functionally identical to the existing components. Therefore, there will be no negative effects on any protective boundaries.

3. **Discuss the impact of the change on the acceptance limits for the protective boundaries identified above.**

As discussed in 2, above, there are no negative effects on any protective boundary.

4. **Identify the margins of safety, related to this change that are defined in the bases of Technical Safety Requirements.**

The bases for Sect. Y.Y.Y of the Technical Safety Requirements for Building XXXX state that hot cell "A" must be maintained at a negative pressure at or below - 1/4 in. of water anytime powdered radioactive material is being handled. This change will help to ensure that this margin is met.

	Yes	No
1. Based upon 1, do the consequences of the design basis accidents exceed the limits for an acceptable change?	___	X
2. Based upon 2, 3, and 4 does the change reduce the margin of safety provided for the protection boundaries?	___	X
3. Based upon 4, does the change reduce other margins of safety in the bases for the Technical Safety Requirements that are not related to the boundaries?	___	X

PART IV: SAFETY EVALUATION CONCLUSIONS

Based upon the safety evaluation the change.

_X_ **does not constitute an unreviewed safety question.**

___ **does constitute an unreviewed safety question.**

PART V: SPECIAL REQUIREMENTS

1. A procedure will be written to direct the operators to monitor and adjust the air-flow rate out of the hot cell if a spill of radioactive material has occurred.

2. After it is developed, the modification plan for this change must be reviewed and this USQD revised to reflect that review before any physical modification is allowed.

3. Handling of powdered radioactive material will be stopped while the existing exhaust system is out-of-service for construction during this modification.

EXAMPLE USQD REFERENCES

1. Thermal Calculation

2. Radiation Calculation

3. Pressure and Structural Calculation

Appendix B

UNREVIEWED SAFETY QUESTION DETERMINATION FORM

INTRODUCTION

SAFETY EVALUATION

PART I: IMPACT ON THE ACCIDENTS AND MALFUNCTIONS CONSIDERED IN THE AUTHORIZATION BASIS

1. Identify the design basis accidents reviewed for potential impact by the change.

2. Discuss how the parameters and systems, affected by the change, impact the consequences of these accidents.

3. Identify the design basis accidents, if any, for which failure modes associated with the changes can be an initiating event.

4. Discuss the impact of the change on the probability of occurrence of the design basis accidents identified in 3.

5. Identify the safety systems and systems important-to-safety affected by the change.

6. Discuss the impact of the change and/or the failure modes associated with the change on the probability of failure of the systems identified.

7. Discuss the impact of the change on the performance of the safety systems.

	Yes	No
• Based upon 2, does the change increase the consequences of a design basis accident?	___	___
• Based upon 4, does the change increase the probability of a design basis accident?	___	___
• Based upon 6, does the change increase the probability of a malfunction of equipment important-to-safety evaluated in the authorization basis?	___	___
• Based upon 7, does the change degrade the performance, i.e., increase the consequences of a malfunction, of equipment important to safety evaluated in the authorization basis:	___	___

If any of the above are answered yes, the change is a USQ.

PART II: POTENTIAL FOR CREATION OF A NEW TYPE OF UNANALYZED EVENT

1. Based upon Part I, assess the impact of the change and/or failure modes associated with the change, to determine if the change has modified the facility response to the point where it can be considered a new type accident. Discuss the basis for this documentation.

2. Determine if the failure modes of equipment important-to-safety associated with the change represent a new unanalyzed type of malfunction. Discuss the basis for this determination.

3. Determine if the change, or a failure mode associated with the change increases the probability of an accident to the point where it should be considered within the design basis.

	Yes	No
Based upon 1, 2, and 3 does the change create the potential for a new type of unanalyzed accident or a new type of malfunction?	_____	_____

If the answer is yes, the change is an unreviewed safety question.

PART III: IMPACT ON THE MARGIN OF SAFETY

1. Based on the results identified in the discussion on the change's impact on previously analyzed accidents and malfunctions, discuss the impact of the consequences on the protective boundaries.

2. Identify how the protective boundaries, if any, are directly affected by the change or a failure mode of the change.

3. Discuss the impact of the change on the acceptance limits for the protective boundaries identified above.

4. Identify the margins of safety, related to this change, that are defined in the bases of Technical Safety Requirements.

	Yes	No
Based upon 1, do the consequences of the design basis accidents exceed the limits for an acceptable change?	_____	_____

	Yes	No
Based upon 2, 3, and 4 does the change reduce the margin of safety provided for the protection boundaries?	____	____
Based upon 4, does the change reduce other margins of safety in the bases for the Technical Safety Requirements that are not related to the boundaries?	____	____

PART IV: SAFETY EVALUATION CONCLUSIONS

Based upon the safety evaluation the change

____ does not constitute an unreviewed safety question

____ does constitute an unreviewed safety question

PART V: SPECIAL REQUIREMENTS

INTERNAL DISTRIBUTION

T. A. Angelelli
H. L. Arnold, Jr. (10)
J. E. Beavers
G. R. Boser
D. J. Bostock
W. A. Burnett, PGDP
D. D. Cannon
M. S. Childers
W. K. Crowley (50)
W. J. Delong
R. G. Donnelly, PORTS
C. E. Gamm, PORTS
G. G. Fee
G. F. Flanagan
H. S. Giles
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