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**PROCEDURE FOR DECISION ANALYSIS
FOR EVALUATING THE SCC CLARIFICATION ALTERNATIVES**

Prepared for

Nuclear Regulatory Commission
Contract NRC-02-88-005
Intermediate Milestone 20-3702-012-245-205

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NOVEMBER 1990

PROCEDURE FOR DECISION ANALYSIS
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1. PURPOSE

The purpose of this procedure is to describe decision analysis methods for evaluating the "substantially complete containment" (SCC) clarification alternatives. The procedure involves analyzing the decision by attributes and ranking decision alternatives against weighted attributes and each other. It should be emphasized that the purpose of this decision analysis process is not to reach a consensus (although that would be a desirable result), but to systematically retrieve, organize, and present data representing various NRC perspectives to senior NRC management for consideration in choosing an appropriate alternative for clarification of "substantially complete containment."

2. BACKGROUND

Decision analysis techniques are used when decisions must be made for complex problems for which simple comparison of or ranking of alternatives cannot be readily done to reach a decision. Examples of problems for which decision analysis is appropriate are many, and they include those for which several objectives and many attributes exist, those for which conflicting objectives exist, and those requiring input from several people or groups whose objectives may conflict.

In decision analysis, a basic step is to assess various alternatives with respect to how well each meets an objective or set of objectives. Alternatives can be assessed with respect to one another in two basic ways: assessing each alternative according to a common scale and ranking by comparison of an alternative to each of the others. In cases where a common scale does not exist for all the alternatives, ranking should be done by comparison. When ranking by comparison, a mathematical consistency check can be made. Ranking by comparison has one disadvantage compared with assessment according to a common scale. When ranking by comparison, if all alternatives rate equally well (or equally poorly) as to meeting an objective, the degree to which an alternative meets the objective is not apparent from the relative ranking. Therefore, assessment according to a common scale will be done except in cases where a common scale does not exist for all the alternatives.

Two documents which have been used as guidelines for the development of this procedure are listed below.

- NRC NUREG/CR-3447: Research Prioritization Using the Analytical Hierarchy Process, August 1983, and
- CNWRA Technical Operating Procedure: TOP-015, Procedure for Decision Analysis, June 1990.

These guidelines have been amended and altered with subtle variations unique to the specific application. The resultant procedure presented here is intended as a specific guideline.

Many techniques are available to the decision-maker for special cases, and these may be found in the references cited below.

- Bonano, E. J., et al, NUREG/CR-5411, "Elicitation and Use of Expert Judgment in Performance Assessment for High-Level Radioactive Waste Repositories," Sandia National Laboratories, 1990.
- Trueman, R. E., An Introduction to Quantitative Methods for Decision Making, Holt Rinehart Winston, 1974.
- Keeney, R. L., Siting Energy Facilities, Academic Press, 1980.
- Keeney, R. L., and Raiffa, H., Decisions with Multiple Objectives, John Wiley, 1976.
- Saaty, T. L., The Analytic Hierarchy Process, McGraw-Hill, 1980.

3. RESPONSIBILITY

3.1 The decision analysis process will be conducted by a NRC-selected coordinator/elicitor and a NRC-selected panel. The Center for Nuclear Waste Regulatory Analyses (CNWRA or Center) will initially work with the coordinator/elicitor and the panel to ensure that all the necessary objectives and the associated attributes are covered. Also, the level and detailed description of each attribute will be examined for the purposes of clarity. The panel of participants will have input to review draft objectives and associated attributes, after which the Center, in conjunction with the coordinator/elicitor, will issue a report with the revised objectives and associated attributes.

The recorder for elicitation sessions will be provided by the Center, while the coordinator/elicitor will conduct the sessions. Once the panel has completed its deliberations, the Center will assist the NRC in the analysis of the data and participate in a presentation to NRC senior management at the end of the decision analysis activity.

3.2 Key personnel acting as organizational contacts are:

NRC Technical Lead	Dr. Lee Abramson	(301) 492-3949
NRC Program Element Manager	Dr. Jerome Pearing	(301) 492-0508
CNWRA Principal Investigator	Dr. Prasad Nair	(512) 522-5150
CNWRA Program Element Manager	Dr. Prasad Nair	(512) 522-5150

4. DEFINITIONS

4.1 Basic Information

- 4.1.1 Decision Alternatives -- Decision alternatives are the choices available to the decision maker as possible outcomes for a candidate.
- 4.1.2 Decision Objectives -- Decision objectives are the goals of the decision. A decision may be based on one or more objectives. An objective has two characteristics: it identifies a concern about alternatives and it allows for the expression of preference, or choices among alternatives.
- 4.1.3 Attributes -- Attributes are salient characteristics of the alternatives which provide measures of the extent to which a decision objective would be met by choosing an alternative. Each alternative is ranked according to how well it facilitates the attribute. When ranking to a common scale, an attribute has an associated scale which may be natural or constructed.

4.2 Process-Related Information

- 4.2.1 Consistency Check -- A consistency check is a method for evaluating the results of the decision analysis in order to assure that the analysis is both repeatable and verifiable.
- 4.2.2 Decision Analysis -- Decision analysis is a systematic and logical procedure for rational analysis of complex decision problems.
- 4.2.3 Elicitation -- In the use of expert judgment, an elicitor assists the expert in expressing judgments and rationales during elicitation.
- 4.2.4 Expert Judgment -- Expert judgment is judgment expressed by an individual whose credentials qualify her or him as an expert or authority on the given subject.
- 4.2.5 Objectives Hierarchy -- An objectives hierarchy links objectives and attributes by their relative primacy and their relationship to each other.
- 4.2.6 Rank -- Rank is the extent to which an attribute applies to an alternative. The rank of an alternative against an attribute will be reflected in the scale associated with that attribute. Ranking is the act of assigning a rank to an alternative for a specific attribute. During the consistency check, attributes are ranked in order of importance or degree of application to each alternative.

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- 4.2.7 Scale -- A scale is used when alternatives are ranked against attributes. There are two types of scales: "natural" scales (which exhibit common use and meaning) and constructed scales (which are developed to address a specific attribute or problem for which no natural scale exists). For example, the attribute of "cost" has a natural scale of dollars, while the attribute of "environmental damage" would use a constructed scale which would index relative damage by assigning numerical values ranging from "no damage" to "severe damage."
- 4.2.8 Sensitivity Analysis -- Sensitivity analysis is an investigation of the decision. This investigation is made by systematically changing relative weights assigned to the attributes and comparing variations in the results of the decision analysis. A sensitivity analysis is used to determine the relative influence which an attribute or specific objective has on the final result of the decision analysis. For a sensitivity analysis, the weights assigned to attributes must be relative, and the total sum of the weights must not vary.
- 4.2.9 Weight -- The weight assigned to an attribute indicates the relative importance of that attribute to the decision maker. Different attributes may be weighted differently or have different degrees of importance to the decision maker. For example, one attribute may be three times as important to the decision maker as another attribute, which may in turn be only half as important as another attribute. Weighting is the act of assigning weights to attributes. For the purpose of evaluating the SCC clarification alternatives, weighting will be done individually by participants by pairwise comparison of objectives and pairwise comparison of attributes.

4.3 Participants-Related Information

- 4.3.1 Decision Analyst -- A decision analyst is an individual performing the decision analysis, who provides documentation of both the method and the decision process. A decision maker may use the assistance of decision analysts or may function individually as a decision analyst.
- 4.3.2 Decision Maker -- The decision maker is the individual or organization responsible for the decision in question: the one making the actual decision.
- 4.3.3 Elicitor -- An elicitor is the individual who presents the process of the decision analysis to an expert or a panel convened for input to the decision and then elicits appropriate responses from the expert or panel

for use in the decision analysis. The elicitation of responses from the panel must be done without bias to the extent practical, and, as a result, it is preferable that the elicitor have training in such a process.

- 4.3.4 Normative Expert -- A normative expert is one who is familiar with the substance of the decision being made as well as with the techniques of decision analysis and with theories and concepts of probability.
- 4.3.5 Panel -- A panel is group of individuals chosen to participate in the decision analysis and from whom responses are elicited for the purpose of ranking.
- 4.3.6 Recorder or Secretary -- The recorder or secretary is an individual who records elicited responses from a panel. By use of a recorder, the elicitor is not burdened with such recording, and the process of elicitation is often made more efficient as a result.

5. THE DECISION ANALYSIS PROCESS

5.1 Basic Features, Steps, and Options in the Process

The following outline gives the basic steps in the decision analysis for evaluating the SCC clarification alternatives.

OUTLINE OF STEPS TO BE USED IN THE DECISION ANALYSIS PROCESS

- 1. Define the general decision analysis process
- 2. Select the panel members
- 3. Introduce the panel to the problem
 - a. Distribution of background material (reports, etc.)
 - b. Distribution of draft objectives and attributes
- 4. Initial meeting of panel (November 19, 1990)
 - a. Technical briefing on background
 - b. Decision alternatives
 - c. Overview of the decision analysis procedure
 - i. Agreement on overall goals
 - ii. General steps in the procedure
 - A. Panelists rank alternatives as to how well they meet each attribute
 - B. Panelists weigh of objectives and attributes with respect to importance
 - C. Object is to get input, not necessarily consensus
 - d. Panel discussion and critique of objectives and attributes
 - i. Ground rules defined
 - ii. Develop revised objectives and attributes (if necessary)
- 5. Panel to receive and study procedure
- 6. Second meeting of panel (December 6, 1990)
 - a. Train panel on procedure for the particular decision analysis exercise
 - b. Description of elicitation details

- i. Compare objectives with respect to (w.r.t.) one another and describe rationale for the selected ranking
- ii. Compare attributes w.r.t. meeting each objective and describe rationale for the selected ranking
- iii. Assess each alternative w.r.t. how well it meets a specific attribute
 - A. Assess according to 0-10 scale
 - B. Describe rationale for the assessments
 - C. Review ranking of the alternatives to check consistency
 - D. Revise assessments according to scale and rationales, if desired
 - E. Do not bias assessments because objective or attribute is not considered important, as this information is captured separately when objectives and attributes are separately weighted
7. Elicitation of individual panel members (December 7-14, 1990)
8. Analyses of elicitations
9. Third meeting of panel (January 7, 1991)
 - a. Feedback of results to panel
 - b. Opportunity for change of opinion
 - c. Determine need for re-elicitation (secret ballot)
10. Re-elicitations (if necessary)
11. Analyses of elicitations, including feedback from third meeting (and re-elicitations, if necessary)
12. Report of results

5.2 Discussion of Unique Features of the Procedure

This procedure uses features of decision analysis theory in a way intended to maximize benefit to the decision-maker. Ranking to a common scale is used wherever possible, since the mathematical manipulations required during analysis are more intuitive and simpler, and more information can be obtained than for ranking by comparison. On the other hand, pairwise comparison is used to advantage when a common scale is not possible to construct, as, for example, when comparing objectives and attributes to obtain weighting factors for each.

5.3 Group Elicitation and Analysis

When a panel of participants is convened for decision analysis, pressure to conform and other group dynamics must be contended with. For this procedure, the group is first convened to come to agreement on ground rules, objectives, and attributes and for orientation on the problem. After that, the first round of elicitation is done individually so that effects of group dynamics are avoided. When results from the first round of elicitation are presented, the panel again convenes as a group and individuals are allowed to alter their first round judgments. If, after results from the second round are tabulated and they indicate no consensus, a decision is made by secret ballot of participants whether or not to re-elicite judgments individually before preparing the final report of results.

6. ELICITATION TRAINING AND ELICITATION

The purpose of elicitation training is to help the participants learn how to encode their knowledge and beliefs into quantitative forms. Elicitation training can significantly improve the quality of the participants' assessments by avoiding psychological pitfalls which can lead to biased and/or overconfident assessments. It is useful to schedule the training session early in the decision analysis process, e.g., immediately following the selection of issues and participants. The training should be carried out by a substantive expert who is knowledgeable about the issues to be assessed and a normative expert who is knowledgeable about decision theory and the practice of probability elicitation.

The elicitation sessions should be held as soon as possible following the discussion of issue analyses and the selection of elicitation variables such as objectives and attributes. An elicitation team should meet separately with each expert, to avoid pressure to conform and other group dynamics interactions which might occur if the expert judgments were elicited in a group setting.

The elicitation team should consist of a substantive expert, a normative expert, and a recorder. It is also useful to add as a fourth member the person who will prepare the final documentation. Individuals may perform more than one function to reduce the number of participants. For example, the normative expert or the recorder may also be familiar with the substance of the decision to double as a substantive expert, and the recorder and normative expert may team to prepare the final documentation.

After elicitation and documentation, the results of the decision analysis should be presented to the panel of participants as a group, at which time each may change any decisions previously made. If the results produced from this second round do not indicate a choice or if they appear inconsistent, a second elicitation may be appropriate. In some cases, a consensus may not be reached even after the second elicitation, in which case the results should be presented to the decision-maker as a complete set of information upon which to base the decision. In such cases, the rationales presented by the participants may influence the decision as much as the results of the decision analysis.

7. DEFINING THE PROBLEM AND ALTERNATIVE SOLUTIONS/CHOICES

The problem for which a decision is required should be stated clearly and concisely, so that all who are involved in the decision analysis process are equally and fully aware of the problem. The alternatives which may be chosen should be equally clear and concise when presented to the persons who will rank them. In some cases a large number of alternatives are available, with slight variations for each of several principle alternatives. It is not necessary to list all possible alternatives, but the principle alternatives, those for which clear differences in results are apparent, should be included. This will assure that the spectrum of alternatives is covered without burdening the process with excess effort.

8. DEFINING OBJECTIVES

The goal of the decision is to meet one or more objectives by virtue of choosing an alternative. Each objective should be clearly stated and as independent as possible of the other objectives. Meeting one objective should not necessarily equate to meeting another objective.

9. DEFINING ATTRIBUTES ASSOCIATED WITH OBJECTIVES

For each objective, one or more attributes may be stated which connect the objective to the alternatives. Attributes should be written to clearly bring out particular facets of an objective with respect to the alternatives. As such, the set of attributes for a given objective should be as complete as possible without repetition. If two attributes express essentially the same aspect, then that aspect intrinsically receives an inadvertent additional weighting and the decision analysis process may be adversely affected.

10. CONSTRUCTING SCALES

When assessing to a common scale, it is best to use a "natural" scale whenever possible, since such a scale by definition has a common use and meaning (e.g., dollars, time, etc.). Scales should have the same relative direction for all attributes, so that a high assessment is understood as an assessment of how well an alternative meets the attribute and a low assessment is understood as an assessment of how poorly the alternative fares.

When a "natural" scale is unavailable, a scale must be constructed to index relative value ranging from an indication of "none" to "maximum." For the purpose of evaluating the SCC clarification alternatives, a scale of 0-10 will be used to assess alternatives.

When ranking the objectives and attributes by comparison, to index relative value ranging from an indication of "equal importance" between two choices to "absolute importance" of one choice over another, the scale of relative importance shown in Table I should be used.

TABLE I

Scale of Relative Importance

<u>Intensity of Relative Importance</u>	<u>Definition</u>	<u>Explanation</u>
1	Equal importance	Two activities contribute equally to the objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored, and its dominance is demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	Use when compromise is needed

11. RANKING

Before ranking, it is very important that each individual participant asked to perform the ranking have a common understanding of the objectives, alternatives, attributes, and ranking scales. Before assessing alternatives, each participant will be asked to make pairwise comparisons of the objectives as well as the attributes associated with each objective in order of preference. The results will be used to weight objectives, and attributes by degree of importance. When assessing alternatives, each alternative should be judged only with respect to how well it correlates with the attribute of interest. How well it correlates with other attributes must be excluded, and participants' biases for or against the attribute and its associated objective should not enter into the assessment of alternatives. The participants will have had an opportunity to judge each attribute and objective separately before alternatives are assessed.

It should be noted that each participant's judgments will be questioned during the elicitation process, to ensure that the response recorded accurately portrays the participant's opinions.

11.1 Assessing to a Common Scale

Each alternative should be assessed individually to indicate the judgment of how well it meets each individual attribute. Ideally the common scale would be "natural," to avoid error in interpreting the scale. Since a scale is to be constructed, it will be based on a scale of 0 ("none") to 10 ("maximum"). When assessing to a common scale has been completed, a check for consistency will be done by arranging the alternatives in order of preference along with the ranking of each, to see if re-assessment is in order to most accurately reflect the participant's judgment. Rationales for decisions should be recorded by the recorder at the time the assessment is done.

For three of the objectives, attributes are categorized by time of importance; that is, attributes are classified as either pertinent prior to submittal of the license application or after submittal of the license application (see Attachment A). Participants will be asked to directly weight the importance of each of these two time periods with respect to each objective (e.g., pre-submittal = 0.6 and after submittal = 0.4). This will provide an additional measure of weighting which will be reported with the results of the analysis. Ranking by comparison is not used here for the case when only 2 items are to be compared since the mathematics in such a case does not allow sufficiently fine distinctions.

11.2 Ranking by Comparison

Each objective should be compared in a pairwise fashion to each other objective individually to indicate the judgment of how it compares to each of the other objectives in meeting the goals. The same process should next be used for comparing attributes to one another. The results will be used to weight objectives and attributes by degree of importance. Consider the following hypothetical ranking of objectives as an example. For the given four objectives, 'A', 'B', 'C' and 'D', 'A' and 'B' may be considered equally important to a participant, but 'A' may have strong importance when compared to 'C', 'A' may be considered absolutely more important than 'D'. Additionally, 'B' may have demonstrated importance when compared to 'C' and 'B' may be considered slightly favored (weak importance in Table I) over 'D'. Finally, 'D' may be considered slightly favored over 'C'.

Using the scale of relative importance in Table I, the relative importance assigned to each of 'A', 'B', 'C' and 'D' are given in the following example Table II, where the comparisons are done in terms of which element dominates, expressed as an integer. If element I dominates over element J, then the dominance integer is entered in row I and column J, and the reciprocal is entered in row J and column I.

TABLE II

Example Showing Relative Importance in the Matrix

<u>Attribute of Interest</u>	<u>'A'</u>	<u>'B'</u>	<u>'C'</u>	<u>'D'</u>	<u>Normalized Weights</u>
'A'	1	1	5	9	.4801
'B'	1	1	7	3	.3604
'C'	1/5	1/7	1	1/3	.0556
'D'	1/9	1/3	3	1	.1039

Procedures for mathematical manipulation by matrix algebra to determine normalized weights are described in Saaty, T. L., The Analytic Hierarchy Process, McGraw-Hill, 1980.

Although the example given is for weighting objectives, the pairwise comparison process will be used also for weighting attributes, since there is also no common scale by which to rank them.

A normalized weight will be assigned to each of the objectives and attributes to reflect each participant's evaluation as a result of this exercise.

11.3 Recommended Practice

While there is merit to either assessing by a common scale or by relative importance in the decision analysis process, it is recommended that the former be used in evaluating alternatives and the latter for weighting the objectives and attributes.

ATTACHMENT A

**OBJECTIVES AND ASSOCIATED ATTRIBUTES
FOR EVALUATING THE SCC CLARIFICATION ALTERNATIVES**

EBS Intermediate Milestone No. 20-3702-012-245-105

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**OBJECTIVES AND ASSOCIATED ATTRIBUTES
FOR EVALUATING THE SCC CLARIFICATION ALTERNATIVES**

REPORT

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NOVEMBER 1990

Objectives and Associated Attributes for Evaluating the SCC Clarification Alternatives

Introduction

In FY90, the Center completed a detailed technical feasibility study on the clarification of the current regulation for "substantially complete containment" in 10 CFR 60.113 using quantitative means. The study produced two NUREG reports: the first outlines the technical considerations required to be addressed in developing the basis for designing for containment, and the second presents a methodology for quantitative representation of technical information such that an evaluation criterion for "substantially complete containment" can be developed. The second report also presents state-of-the-art techniques for evaluating uncertainties for the various technical considerations to be used in designing for containment. As part of the technical feasibility study, a feasibility assessment and alternatives report was also prepared. This report concluded that a reasonable quantitative approach can be taken to clarify the "substantially complete containment" requirement. The report identified four alternative ways of introducing a quantitative approach within a regulatory framework. These alternatives were prepared to provide NRC with a broad range of regulatory implementation possibilities.

This letter report presents a systematic description of the basis on which the selection of an alternative can be made from among the ones described in the third (technical feasibility study) report. A hierarchy of goals, objectives, and attributes associated with the decision analysis process is presented in this report.

Purpose and Goals

The purpose of the decision analysis for establishing the direction for the resolution of the uncertainty in the current regulation dealing with "substantially complete containment" is to meet the statutory NWPA requirement that the Commission reach a decision on the construction authorization within 36 months after receipt of the DOE license application. The Commission has testified before Congress that it would support the requirement in the NWPA, provided that DOE submitted a high-quality application.

Based on the purpose of the decision analysis, a high-order set of goals can be described. The goals are:

GOAL 1. Provide authoritative guidance to DOE sufficient to ensure no misunderstanding of specific NRC regulatory requirements that would otherwise be likely to impair the submission of a high-quality application for a construction authorization.

GOAL 2. Provide authoritative interpretive positions regarding specific NRC regulatory requirements to the NRC technical staff so that associated technical capabilities will be available to review and process a high quality application for a construction authorization promptly without delays associated with regulatory uncertainty.

GOAL 3. Reduce, to the extent practical, opportunities for contentions during the licensing hearing regarding uncertainties about NRC's regulatory requirements so that, together with other measures to

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streamline the licensing process, a Commission decision on the construction authorization can be made within 36 months after receipt of the application (or as soon thereafter as is reasonably feasible).

Objectives

With respect to the specific uncertainty concerning the meaning of "substantially complete containment" (SCC), the following objectives may be derived from the high-order goals previously stated. All of the goals are addressed by the objectives and each objective is independent.

Objective 1

To ensure compliance with DOE's repository program schedule and to ensure meeting the statutory deadline for license application review.

Note: Ensures that guidance can be made during the time available for guidance development. Timeliness is an important consideration to NRC from two perspectives: (1) the requirement outlined in the NWPAA [Federal Register 10134(e)] that federal agencies must either comply with DOE's repository program schedule or explain the reason for delay to the Secretary and to Congress, and (2) the NWPAA mandates that the Commission "... shall issue a final decision approving or disapproving the issuance of a construction authorization not later than the expiration of 3 years after the date of submission of such application, except that the Commission may extend such deadline by not more than 12 months if, not less than 30 days before such deadline, the Commission complies with the reporting requirements established in subsection (e)(2) ..." [reference Federal Register 10134(d)].

Objective 2

To provide a criterion for the containment requirement that the license applicant can be reasonably expected to comply with and clear enough so that NRC will be able to determine compliance.

Note: This objective is aimed at do-ability of the chosen alternative. The objective is to ensure that the criterion is one which is reasonably possible to comply with. The alternative which is chosen must have a high probability of acceptance by the applicant and must result in required actions which are feasible. In addition, the alternative should result in providing clarity, which speaks to the minimization of any new uncertainties. It should be possible at the time of implementing the alternative to see a "path" toward a known "destination" of compliance.

Objective 3

To minimize the level of effort required for implementing the alternative and for evaluating the license application based on the alternative.

Note: The "level of effort" in this context means the expenditure of NRC resources that would be needed. Such resource expenditure could be for NRC staff or for contractors, and it could be incurred during guidance development before license application or during compliance assessment after a license application has been submitted.

Objective 4

To facilitate public acceptance of and confidence in the safe containment of HLW.

Note: This objective is included to ensure that the design which complies with the SCC requirement will be "good" to a degree sufficient to satisfy all interested parties (State, Indian tribes, individuals, etc.). This objective had been revised to read "To ensure a safe design to protect the public health and safety," but the original language was reinstated for the following reason. If DOE complies with the requirements of NRC, which are conservatively based on EPA requirements, a safe design will be ensured. This objective is not aimed at ensuring that DOE complies with NRC requirements, however; it is instead concerned with public acceptance and confidence in NRC decisions regarding disposal of high-level nuclear waste

Associated with each objective is a set of attributes, which are given below.

Objective 1

To ensure compliance with DOE's repository program schedule and to ensure meeting the statutory deadline for license application review.

Attributes

Prior to Submittal of the License Application:

- P1. Prevent Schedule Delays Due to Alternate Interpretation of SCC:

Pursuing the alternative will reduce the uncertainty in the interpretation of SCC so that no delays in the applicant's schedule will occur due to the need for periodic NRC guidance. Pursuing the alternative will ensure that guidance provided by NRC to the applicant concerning the containment requirement is as complete as necessary and contains an adequate level of detail so that no delays in the schedule occur as a result. Pursuing the alternative will not introduce any new regulatory or technical uncertainties, thereby ensuring that the time required for prelicensing guidance will not cause a delay in DOE's schedule.

After Submittal of the License Application:

- A1. Prevent Schedule Delays Due to Alternate Interpretation of SCC:

Pursuing the alternative will reduce the uncertainty in the interpretation of SCC so that the requirement on NRC for a construction authorization decision within the three-year allowable time period can be met. Pursuing the alternative will ensure that guidance provided by NRC to the applicant concerning the containment requirement is as complete as necessary and contains an adequate level of detail so that no delays in the schedule occur as a result. Pursuing the alternative will not introduce any new regulatory or technical uncertainties, thereby ensuring that the required schedule for compliance determination activities can be met. Pursuing the alternative will ensure that the applicant's compliance demonstration method is consistent with that expected by NRC so that no delays in the schedule occur as a result.

- A2. Ensure Completeness of Information Available to Reviewer and Decision-Maker:

Pursuing the alternative will ensure that the information on the applicant's design for containment, which is available to the Reviewer and Decision-Maker, will be as complete as necessary for timely presentation and license review.

A3. Ensure Ease of Understanding of Information Available to Reviewer and Decision-Maker:

Pursuing the alternative will ensure that the information on the applicant's design for containment, which is available to the Reviewer and Decision-Maker, will be easy to understand, thus ensuring that NRC's review will be completed within the allotted time.

A4. Reduce the Scope for Litigable Issues:

Pursuing the alternative will reduce the scope for litigable issues and, thereby, ensure meeting the statutory deadline required of NRC during the licensing hearing process.

Objective 2

To provide a criterion for the containment requirement that the license applicant can be reasonably expected to comply with and clear enough so that NRC will be able to determine compliance.

Attributes

Prior to Submittal of the License Application:

P1. Ensure the Feasibility of the Design:

Pursuing the alternative will ensure that the applicant has freedom as to how compliance is demonstrated and can submit a feasible design which complies with the NRC requirements/guidance.

After Submittal of the License Application:

A1. Reduce Uncertainty in Determination of Compliance with SCC:

Pursuing the alternative will reduce the uncertainty in the interpretation of SCC, and it will not introduce any new regulatory or technical uncertainties, so that compliance determination is straightforward. As a result, the rule/guidance will be sufficiently clear so that NRC has a firm regulatory basis to determine compliance.

A2. Ensure Completeness of Guidance and Adequate Level of Detail in Guidance:

Pursuing the alternative will ensure that guidance provided by NRC to the applicant concerning the containment requirement is as complete as necessary and contains an adequate level of detail so that compliance determination is feasible.

A3. Ensure Completeness of Information Available to Reviewer and Decision-Maker:

Pursuing the alternative will ensure that the information on the applicant's design for containment, which is available to the Reviewer and Decision-Maker, will be as complete as necessary, thereby providing clarity for compliance determination activities. Pursuing the alternative will portray to NRC the technical uncertainties on predicted containment performance, contributing to the rationale for NRC's decision on compliance determination.

A4. Retain Flexibility for Future Options:

Pursuing the alternative will allow NRC sufficient flexibility for any future options concerning containment which NRC might choose to pursue to make compliance demonstration and/or determination feasible.

Objective 3

To minimize the level of effort required for implementing the alternative and for evaluating the license application based on the alternative.

Attributes

Prior to Submittal of the License Application:

P1. Avoid Introducing New Uncertainties:

Pursuing the alternative will not introduce any new regulatory or technical uncertainties, thereby minimizing the level of effort required by NRC for pre-licensing guidance activities. Guidance provided by NRC to the applicant concerning the containment requirement, as a result of pursuing the alternative, will be unlikely to require re-evaluation which might otherwise affect the level of effort for compliance determination.

After Submittal of the License Application:

A1. Avoid Introducing New Uncertainties:

Pursuing the alternative will not introduce any new regulatory or technical uncertainties, thereby minimizing the level of effort required by NRC for compliance determination activities. Pursuing the alternative will ensure that guidance provided by NRC to the applicant concerning the containment requirement is as complete as necessary and contains an adequate level of detail so that the level of effort for compliance determination is not increased.

A2. Ensure Ease of Understanding of Information Available to Reviewer and Decision-Maker:

Pursuing the alternative will ensure that the information in the applicant's design for containment, which is available to the Reviewer and Decision-Maker, will be easy to understand, thus reducing associated NRC expenditure of resources.

A3. Allow Applicant Freedom of HOW Compliance is Demonstrated:

Pursuing the alternative will allow the applicant freedom of "how" compliance is to be demonstrated, minimizing NRC level of effort required.

A4. Reduce the Scope for Litigable Issues:

Pursuing the alternative will reduce the scope for litigable issues, thereby reducing the level of effort required.

Objective 4

To facilitate public acceptance of and confidence in the safe containment of HLW.

Attributes

1. Prevent Schedule Delays:

Pursuing the alternative will ensure that no delays in the applicant's repository program schedule will occur due to the need for periodic NRC guidance, thus contributing to public confidence in NRC's regulatory ability and authority.

Pursuing the alternative will ensure that NRC is able to meet the three-year time period for deciding on issuance of construction authorization, thus contributing to public confidence in NRC's regulatory ability and authority.

2. Assurance of Conservative Design:

Pursuing the alternative will contribute to assurance that the applicant will produce a conservative design, contributing to public acceptance and confidence for the safe containment of HLW. Aspects of the design which should be retained to ensure conservatism should include the following: (1) the multiple barriers approach; (2) allowance for final finding on SCC at the time of decision on permanent closure; (3) consistency with release limits for the period after containment; and (4) maintaining the relationship to EPA standards. Pursuing the alternative will ensure that NRC and other parties will be aware of uncertainties in performance predictions made by the license applicant, contributing to the rationale for NRC's decision on compliance determination and increasing public confidence in and acceptance of NRC's decision. Pursuing the alternative will ensure that adequate Quality Assurance procedures are adopted and followed by the license applicant, thereby contributing to public acceptance and confidence in NRC's licensing decisions concerning the safe disposal of HLW.

Text for letter of transmittal 11/27/90:

Enclosed is our report on "Objectives and Associated Attributes for Evaluating the SCC Clarification Alternatives," which reflects changes adopted as a result of our November 19 meeting in White Flint with the panelists and subsequent telephone conversations with Dr. Lee Abramson of NRC Research. Please distribute copies of this report to the panelists and interested members of your staff.