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United States Government **Department of Energy**

memorandum

DATE: May 27, 1993

REPLY TO ATTN OF: EH-25

SUBJECT: Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements

TO: Secretarial Officers and Field Office Managers

I am pleased to provide for your use the attached paper, "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements" (hereafter "Recommendations"), that is designed to facilitate DOE's compliance with the National Environmental Policy Act (NEPA). The Recommendations should materially aid those responsible for preparing and reviewing these NEPA documents to focus on significant environmental issues, adequately analyze environmental impacts, and effectively present results to decisionmakers and the public. Because each DOE proposed action presents a unique set of circumstances and potential impacts, the paper emphasizes the need for thoughtful case-by-case application of the guidance and discourages a cookbook approach to NEPA compliance. Please note the endorsement (attached) this paper has received from the General Counsel of the Council on Environmental Quality.

Development of the Recommendations

The Recommendations were prepared by my Office of NEPA Oversight in consultation with the Office of the Assistant General Counsel for Environment. The Department's NEPA Compliance Officers (NCOs) also played a significant role. In large measure, this paper responds to guidance needs that NCOs have identified to us. NCOs provided helpful comments at several opportunities while the paper was under development and support use of such guidance throughout DOE. As suggested by the NCOs, we intend to update and supplement the paper periodically.

Implementation

Implementing these Recommendations should provide immediate benefits. Because DOE's requirements will be clearer, adequate NEPA analyses should be prepared, reviewed, and approved more quickly. It is important, therefore, that you disseminate this guidance to appropriate staff and contractors as soon as possible.

You should also task your NCO to provide training to apply these Recommendations effectively, as required by DOE 5440.1E, and my Office of NEPA Oversight has been working with NCOs to help assure that they have the requisite knowledge. We are developing additional training tools, but I urge you to begin your own program immediately. We will shortly provide your NCOs with sufficient copies of the Recommendations for an initial distribution.

Please direct any questions and suggestions regarding Recommendations to Stanley Lichtman, Director, Waste Activities Division, Office of NEPA Oversight at (202) 586-4610.

Peter N. Brush
Acting Assistant Secretary
Environment, Safety and Health

Attachments

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
WASHINGTON, D.C. 20503

April 6, 1993

Mr. Raymond P. Berube
Deputy Assistant Secretary for Environment
Department of Energy
1000 Independence Avenue, S.W.
Room 7A-075
Washington, D.C. 20585

Dear Ray:

Lucy Swartz and I recently had the opportunity to review the draft final version of the "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements" which was developed in the Office of NEPA Oversight. We provided comments to that office which I understand will be considered along with comments received from internal Department of Energy reviewers.

While, as noted, we did have some suggestions, Lucy and I were both very impressed with the document and think that its authors should be commended. The manual is informative, well-written, and demonstrates a strong commitment to the letter and the spirit of the National Environmental Policy Act. This is indeed a fine effort which I hope other federal agencies will emulate.

Sincerely,

Dinah Bear
General Counsel

cc: Carol Borgstrom
Director, Office of NEPA Oversight

Recycled Paper

Note: This publication, also referred to as the "Green Book," is available separately as a bound document.

RECOMMENDATIONS FOR THE PREPARATION OF ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL IMPACT STATEMENTS

U.S. DEPARTMENT OF ENERGY
OFFICE OF NEPA OVERSIGHT
MAY 1993

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Preface

This paper provides guidance for the Department of Energy's preparation of environmental assessments and environmental impact statements under the National Environmental Policy Act of 1969 (NEPA). The paper was prepared by the Office of NEPA Oversight, in consultation with the Office of the Assistant General Counsel for Environment. These recommendations should materially aid those responsible for preparing and reviewing NEPA documents in focusing on significant environmental issues, adequately analyzing environmental impacts, and effectively presenting the analysis to decisionmakers and the public. These recommendations are not all-encompassing, however; preparers must apply independent judgment to determine the appropriate scope and analytical requirements of NEPA for each proposed action.

The Office of NEPA Oversight plans to revise this guidance from time to time to address additional issues and, as necessary, to reflect any new policies, regulations, and judicial determinations. The Office welcomes suggestions for improvement.

RECOMMENDATIONS FOR THE PREPARATION OF ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL IMPACT STATEMENTS

1. HOW TO USE THIS PAPER

Introduction

The purpose of this paper is to improve the quality of environmental assessments (EAs) and environmental impact statements (EISs) that the U.S. Department of Energy (DOE) prepares under the National Environmental Policy Act of 1969 (NEPA) and to expedite their review and approval. This paper provides many recommendations for document preparation and, for some topics, background information on issues.

Sections 2 through 8 generally follow the list of topics provided in the Council on Environmental Quality's (CEQ's) regulations as a recommended format for EISs (40 CFR 1502.10). The discussions in this paper, however, are intended as general guidance in preparing EAs as well as EISs. Where there are distinctions to be drawn between EAs and EISs, such distinctions will be highlighted. Section 9 covers general principles that will improve the readability of any NEPA document.

Because each DOE proposed project or program presents a unique set of circumstances and potential impacts, the preparation of EAs or EISs does not reduce to a simple formula or cookbook. Therefore, the recommendations in this paper should be adapted to the particular circumstances presented by each proposed action, often by using a "sliding scale" approach.

Sliding Scale

The sliding scale approach to NEPA analysis recognizes that agency proposals can be characterized as falling somewhere on a continuum with respect to environmental impacts. This approach embodies instruction that CEQ has provided (40 CFR 1502.1 and 1502.2, for example) with respect to preparation of EISs, but which also makes good sense for EAs. Key elements of this instruction are to focus effort on significant environmental issues and alternatives and to discuss impacts in proportion to their significance.

The term "scale" refers to the spectrum of significance of environmental impact. Generally, those proposals with greater potential for significant environmental impact require more analysis than those proposals with very small environmental impacts. (Note that under CEQ's regulations and judicial rulings, heightened technical controversy is a factor in determining

significance.) Thus, as a general rule, where a proposal falls on the sliding scale of significance will determine the extent of analysis required.

In other words, in using the sliding scale approach to NEPA analysis, the preparer should analyze issues and impacts with the amount of detail that is commensurate with their importance. Thus, those proposals with clearly small environmental impacts usually will require less depth and breadth of analysis, either in identifying alternatives or analyzing their impacts. Conversely, as proposals fall increasingly closer to the other end of the scale, the depth and breadth of analysis will increase.

The sliding scale approach clearly recognizes that some EAs need to be more complex than others. The sliding scale approach, however, should not be used to attempt to address potentially significant impacts in a complex EA, rather than preparing an EIS. Further, the concept of the sliding scale, when applied to a proposed action of low potential for significant impacts, does not justify preparing an EA that does not conform to the recommendations set forth in this paper.

Recommendations

- Apply the advice in this document thoughtfully and sensibly in light of the specific circumstances each proposed action presents.

- Use this paper as one tool among many. This paper does not provide comprehensive guidance on the preparation of EAs or EISs, or a comprehensive checklist, or a replacement for good judgment.

- Focus EAs and EISs on impacts and issues with potential for significant environmental impacts. Identify trivial issues and impacts as such without inordinate consideration. Include only enough discussion to show why more study is not warranted.

- Prov[illegible] information that a concerned citizen might want.

- Where substantial deviation from this general guidance appears necessary, arrange discussions, through the NEPA Compliance Officers, among cognizant program and field offices and the Office of NEPA Oversight, and General Counsel, as appropriate, on the approach to the EAs or EISs.

2. DOCUMENT SUMMARY

Background

A document summary facilitates the review of an EA or EIS. CEQ's regulations (40 CFR 1502.12) require a summary for an EIS. Although not required, a brief summary may be included in an EA.

Recommendations

To present an effective summary:

- Describe the content of the document.
- Describe the underlying purpose and need for agency action.
- Describe the proposed action.
- Describe each alternative addressed in the document.
- Identify the preferred alternative (if different from the proposed action).
- Describe the principal environmental issues analyzed and the results.

To avoid commonly encountered problems with summaries:

- Make data and discussions consistent with information in the document.
- Highlight key differences among alternatives.
- Address the entire EA or EIS (that is, do not focus only on one part).

3. PURPOSE AND NEED FOR ACTION

Background

An EIS must briefly specify the underlying purpose and need to which the agency is responding in considering the alternatives, including the proposed action (40 CFR 1502.13). An EA must include a brief discussion of the need (40 CFR 1508.9). (CEQ's regulations do not distinguish between "purpose" and "need," and CEQ uses the terms together and separately.)

The statement of purpose and need should define the need for DOE action, not for the proposed action (or preferred alternative). The statement of purpose and need is not a justification of what DOE proposes to do, but instead is a description of the underlying purpose and need to which the agency is responding (that is, an explanation of why agency action is needed). In general, the statement of purpose and need should reflect the goals to be achieved by the statutory authority under which DOE is proposing to act.

The statement of the agency's underlying purpose and need is critical to identifying the range of reasonable alternatives. If the purpose and need are defined too broadly, the number of alternatives that might require analysis would be virtually limitless. It is inappropriate in most situations, however, to define purpose and need so narrowly that only the proposed action would meet the need. The proposed action is generally only one means of meeting the agency's purpose and need for action.

Recommendations

- Relate the statement of purpose and need to the broad requirement or desire for agency action, not to the need for a specific proposal.

  Explanation: A statement of purpose and need for agency action could be that a site needs to perform laboratory analysis within 24 hours of water sampling to be in accordance with quality assurance procedures. An inappropriate statement of purpose and need would be that the agency needs to construct a new on-site laboratory; a new on-site laboratory, however, could be the proposed action.

- Write the statement of purpose and need to identify the problem or opportunity to which the agency is responding.

  Explanation: If the purpose and need for agency action is a requirement to perform laboratory analysis within 24 hours of sampling to be in accordance with quality assurance procedures, the range of reasonable alternatives could be limited to on-site laboratory construction, and expansion or use of nearby off-site laboratories.

  However, if the purpose and need for agency action is a need for increased laboratory analysis capability (i.e., without a 24-hour turnaround restriction), the range of reasonable alternatives would likely also include using DOE and commercial laboratories nationwide.

- Describe the purpose and need in a way that does not inappropriately narrow the range of reasonable alternatives. Do not include conceptual design specifications in the purpose and need statement if these will unreasonably narrow the range of alternatives.

  Explanation: Even if the purpose and need for agency (i.e., DOE) action is to conduct a specific research and development project or to apply a specific new technology, there may be reasonable location alternatives (e.g., within a DOE installation, at another DOE installation, or at a non-DOE site).

4. DESCRIPTION OF ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Background

In defining the scope of an EIS or EA, it is important to clearly describe the proposed action and identify the range of reasonable alternatives to the proposed action. In general, the range of reasonable alternatives is broader and the number of alternatives appropriately subjected to an impacts analysis ("analyzed alternatives") is greater in an EIS than in an EA. (In this paper, "analyzed alternative" means an alternative, including no action, whose environmental impacts are assessed.) The following subsections address how to describe the proposed action and determine the range of reasonable alternatives, and how to avoid improper segmentation. The depth of analysis required for assessing potential impacts of the alternatives and comparing alternatives (once they are described) is addressed in Section 6.

CEQ's regulations direct all agencies to use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment (40 CFR 1500.2(e)). In formulating (and analyzing the impacts of) the proposed action and alternatives, also comply with DOE's Policy on Waste Minimization and Pollution Prevention (August 20, 1992), which expresses a DOE commitment to "the inclusion of cost-effective waste minimization and pollution prevention in all of its activities, including consideration of these concepts and approaches in DOE's program planning and major assessment processes, where appropriate, such as NEPA. . . ."

CEQ's regulations require that EISs identify those alternatives that have been eliminated from detailed study (i.e., impacts analysis) because they are unreasonable and briefly discuss why they have been eliminated (40 CFR 1502.14(a)). Although not required by CEQ's regulations, a comparable practice should be followed for EAs, particularly when parties who are questioning the action have suggested alternatives that DOE believes do not address the purpose and need, or are unreasonable in other respects, such as impractical cost. If all or nearly all prospective alternatives are found to be unreasonable, it should be a warning that the purpose and need may be too narrowly identified. (See Section 3.)

4.1 THE PROPOSED ACTION

Recommendations

o Describe the proposed action in sufficient detail so that its potential impacts can be identified.

Explanation: As appropriate, include the following elements in the description of the proposed action --

(1) *general project progression* - information on construction milestones, projected operating cycle, and any aspects of the proposed action that could result in impacts that vary over time (for example, with time of day or season of the year);

(2) *pre-operational activities* - information on construction, including pre-construction site surveys, site clearing, access road construction, and other activities that would be necessary to support construction;

(3) *operational activities* - description of project and related support operations or facilities on-site and off-site, including identification of roads, parking lots, utility hook-ups, borrow sites, and maintenance and transportation activities. Identify waste streams in general (including emissions) and state how they would be treated and/or disposed of; and

(4) *post-operational requirements* - description of reasonably foreseeable future requirements including site close-out and site restoration. Frequently only limited discussion of decontamination and decommissioning or other such distant future post-operational activities is possible. In such cases, include a statement that a separate NEPA review may need to be undertaken before such future activities occur.

o When identifying releases, include rate and duration. Provide an explanation when it is not possible to quantify releases that may result in significant impact.

Explanation: Rather than stating that the discharge rate would be "1.0 mg/hr," say that the rate would be "1.0 mg/hr for 8 hours per day, 5 days per week." The impact of the latter may be more readily determined.

- Do not make the project description so detailed and specific, however, that it would not encompass future modifications.

  Explanation: Rather than specifying the expected volume of chemical to be used in a process per unit time or over the entire length of the project, describe a realistic maximum for both quantities.

- Do not include in the description of the proposed action elements that are more appropriate to the statement of purpose and need.

- In defining the proposed action, consider what mitigation measures are available to reduce environmental impacts. Include routine mitigation measures (e.g., standard construction practices and DOE-required procedures) in the description of the proposed action. Describe other mitigation measures as part of the proposed action if the action is unlikely to proceed without the mitigation (such as scheduling construction or operation not to occur during a migratory endangered species residence on-site) or as alternatives (or subalternatives) if the mitigation is optional (such as constructing noise abatement walls to lower noise levels even further below standards that could be met without the walls).

- Describe private and other Federal agency proposed actions that would be "enabled" by DOE in terms of the DOE action to be taken (such as issuing grants and contracts, participating in cooperative agreements, and performing "work for others").

  Explanation: An EA or EIS should not misrepresent a private action that has been federalized by DOE funding as a DOE action. For example, the EA or EIS should state that "the proposed action is a DOE grant to State University for construction and operation of a new undergraduate chemistry laboratory," rather than stating that DOE proposes to construct and operate a chemistry laboratory at the University. Note that actions by DOE's contractors at DOE's direction are not "private" actions.

4.2 RANGE OF REASONABLE ALTERNATIVES

Background

General

The failure to consider alternatives that seem reasonable affects the credibility of an otherwise adequate NEPA review. As stated above, generally the range of reasonable alternatives is broader and the number of alternatives whose impacts are appropriately analyzed is greater in an EIS than in an EA.

Environmental Impact Statements

CEQ's regulations state that the comparative analysis of alternatives, including the proposed action, is the heart of an EIS (40 CFR 1502.14) and require a rigorous exploration and objective evaluation of reasonable alternatives, including the no action alternative (discussed separately in subsection 4.3).

In "Forty Most Asked Questions Concerning CEQ's NEPA Regulations" (46 FR 18026, March 23, 1981, as amended, 51 FR 15618, April 25, 1986), CEQ states that for EISs, reasonable alternatives include those that are practical or feasible from a common sense, technical, and economic standpoint. This CEQ guidance also states that for an EIS the number of reasonable alternatives considered in detail should represent the full spectrum of alternatives for meeting the agency's purpose and need, but an EIS need not discuss every unique alternative when an unmanageably large number is involved.

Environmental Assessments

CEQ's regulations also require that an EA include a brief discussion of alternatives to a proposed action that involves unresolved conflicts concerning alternative uses of available resources (40 CFR 1508.9(b)). In addition, DOE's NEPA regulations (but not CEQ's regulations) require that the no action alternative be included in EAs (10 CFR 1021.321(c)). Although CEQ's requirement to address alternatives (which stems from section 102(2)(E) of NEPA) has had varying interpretations, courts are increasingly requiring discussion of alternatives in EAs. Thus, the purpose of an EA is not always regarded as simply a basis for determining whether to prepare an EIS.

Unlike EISs, where generally the depth of quantitative analysis is approximately the same for each alternative analyzed in the range of reasonable alternatives, EAs often can focus the quantitative analysis on the proposed action; that is, discussions of alternatives in EAs generally can be qualitative. However, certain EAs may need to identify and analyze more alternatives in the range of reasonable alternatives and provide more in-depth

analysis than usual (e.g., greater quantitative analysis). These EAs generally deal with proposals where there is heightened technical controversy surrounding potential impacts from the proposed action or where there is otherwise greater potential for significant environmental impacts from the proposed action. (See Section 6.)

In other words, where a proposed action falls on the sliding scale will affect the alternatives analysis. All EAs, however, must satisfy minimum requirements as reflected in 40 CFR 1508.9 and 10 CFR 1021.321.

Recommendations

- Identify the range of reasonable alternatives that satisfies the agency's purpose and need.
- If certain alternatives appear obvious or have been identified by the public, but are not reasonable, explain why they are not reasonable.
- Address reasonable alternatives that are outside DOE's jurisdiction, even if they conflict with lawfully established requirements.
- Do not overlook reasonable technology, transportation, or siting alternatives, including off-site alternatives.
- Note that infeasible alternatives are certainly unreasonable, but feasible alternatives may also be unreasonable.
- As a general guide for EAs, use the sliding scale approach described above when determining how many alternatives to identify and analyze in an EA and the depth of analysis to provide for each alternative.

4.3 THE NO ACTION ALTERNATIVE

Background

As discussed in subsection 4.2, the no action alternative must be considered in all DOE EAs and EISs. The no action alternative may or may not be a reasonable alternative.

The reason for considering the no action alternative is often misunderstood. The no action alternative provides an environmental baseline against which impacts of the proposed action (and alternatives) can be compared.

The no action alternative has environmental impacts. Generally, but not always, these would include the environmental impacts of not satisfying the underlying purpose and need for agency action. For proposed new projects, "no action" means that the proposed activity would not take place. For proposed changes to an ongoing activity, "no action" can mean continuing with the present course of action with no changes. It can also mean discontinuing the present course of action by phasing-out operations in the near term.

Recommendations

- Describe the no action alternative in sufficient detail so that its scope is clear and its potential impacts can be identified. Do not simply state that one alternative to the proposed action is no action.

- No action taken by DOE may constitute the only reasonable alternative to the proposed action.

  Explanation: For example, DOE may be involved with a private applicant and faced with a decision that is binary in nature (e.g., fund or not fund, approve or not approve). In such a case, the no action alternative may include several subalternatives consisting of those reasonably foreseeable courses of action that would be available to the applicant if DOE denies its application. DOE should note such apparent subalternatives, and should analyze their impacts to the extent they are reasonably foreseeable by DOE.

- Consider the no action alternative even if DOE is under a court order or legislative command to act (10 CFR 1021.321(c)). (Note that if DOE clearly has no discretion regarding its action, then the action is not subject to NEPA review. See 40 CFR 1508.18 and 10 CFR 1021.104(b).) Include discussion of the legal ramifications of no action, if appropriate.

- Do not use a description of the affected environment as a description of the no action alternative.

4.4 AVOIDING IMPROPER SEGMENTATION

Background

With regard to EISs, CEQ's regulations (40 CFR 1508.25(a)) state that an agency should analyze "connected actions" and "cumulative actions" in one EIS. An agency should also analyze "similar actions" in one EIS when that is the best way to assess adequately the combined impacts of the similar actions or reasonable alternatives.

"Connected actions" are those that automatically trigger other actions that may require EISs, cannot proceed unless other actions are taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for justification. "Cumulative actions" are those that when viewed with other actions proposed by the agency have cumulatively significant impacts and therefore should be discussed in the same EIS. "Similar actions" are those that when viewed with other reasonably foreseeable or proposed agency actions have similarities that provide a basis for evaluating their environmental impacts together, such as common timing or geography. (See 40 CFR 1508.25(a).)

CEQ's regulations are directed at avoiding improper segmentation, wherein the significance of the environmental impacts of an action as a whole would not be evident if the action were to be broken into component parts and the impact of those parts analyzed separately. Although CEQ's regulations do not specifically direct agencies to consider connected actions, cumulative actions, and similar actions in defining the scope of an EA, the impacts from such actions should be considered together in a single EA. (Also see discussion in Section 6.1 on cumulative impacts.)

Recommendations

- Take account of relationships between a proposed action and other actions the agency proposes to take that may affect the same environmental area.

- Include transportation activities as part of the proposed action when the transportation activities would be necessary to make the action happen.

- Think of a proposed action expansively, at least initially, and aim to include rather than exclude activities from the scope of a proposed action.

  Explanation: If a proposed action involves the generation of waste and could not be implemented without construction of a waste storage facility that otherwise would not be needed, the proposed action must include the storage facility. If, however, the storage facility represents a future need that is not yet ripe for proposal, the storage facility may be treated as a connected action with indirect effects (see subsection 6.1). (That is to say, the cumulative impacts of the proposed action and the connected action must be described, but consideration of alternatives for the connected action may be deferred until the connected action is ripe for proposal.)

- Arrange consultations, through the NEPA Compliance Officers, among cognizant program and field offices and the Office of NEPA Oversight, and General Counsel, as appropriate, when there is a substantive question about the scope of a proposed action.

5. THE AFFECTED ENVIRONMENT

Background

CEQ's regulations require a succinct description of the affected environment in a discrete section of an EIS unless an agency has a compelling reason to format an EIS differently (40 CFR 1502.10 and 1502.15). An EA should provide a brief description of the environment to be affected by a proposed action (and by any other analyzed alternative), but there is no prescribed format.

The extent of the "affected environment" may not be the same for all potentially affected environmental components. For example, traffic may increase within four kilometers of a site from which waste would be removed to a nearby landfill (the extent of the affected environment with respect to transportation impacts). In contrast, groundwater extending two kilometers from the site may be affected (the extent of the affected environment with respect to groundwater impacts).

Recommendations

- In describing the affected environment, lay the foundation for evaluating the potential environmental impacts of the proposed action and analyzed alternatives.

  Explanation: Limit the description of the existing environment to information that directly relates to the scope of the proposed action and alternatives whose impacts are to be analyzed; i.e., provide the information that is necessary to assess or understand the impacts. Do not provide information, for example, on hydrogeology or water resources unless the proposed action would consume water or could result in discharges to surface or groundwaters. Where appropriate, incorporate by reference more detailed descriptions of the affected environment.

- Provide sufficient detail concerning environmental parameters (such as air quality) that may be affected by the proposed action and analyzed alternatives to adequately support the impact analysis, including cumulative impact analysis.

- Describe environmentally sensitive resources that are present in the area and that may be affected by the proposed action or analyzed alternatives (such as floodplains and wetlands, threatened and endangered species, prime and unique agricultural lands, and property of historic, archeological, or architectural significance). If such resources are present, be sure to satisfy requirements for environmental review under applicable laws, regulations, and Executive Orders and, to the extent possible, integrate such review with the NEPA review for the proposed action. When appropriate, state that environmentally sensitive resources are not present. Append consultation letters, as appropriate.

6. ENVIRONMENT IMPACTS (EFFECTS)

Background

The discussion below largely concerns approaches for the analysis of impacts (beneficial and adverse). In general, impacts will be more thoroughly analyzed in EISs than in EAs because EISs deal with proposed actions that admittedly may have significant impacts. An EIS must devote substantial and comparable treatment to all alternatives analyzed in the range of reasonable alternatives.

In contrast, an EA may focus the impacts analysis on the proposed action in order to provide the basis for a significance determination. The CEQ regulations (40 CFR 1508.9(b)), howeve equire EAs to include brief discussions of the impacts of alterna (as well as the proposed action) for proposed actions that involve unr ed conflicts concerning alternative uses of available resources. As with e choice of alternatives (subsection 4.2), the impacts of the proposed action and alternatives should be more comparably analyzed in EAs where there is heightened technical controversy surrounding potential impacts or where there is otherwise greater potential for significant impacts. That is, the sliding scale approach applies to impacts analysis in much the same way as it applies to the choice of alternatives.

CEQ's "Forty Questions" (referenced in subsection 4.2) distinguishes between the "environmental consequences section" of an EIS, which should be devoted largely to a scientific analysis of the impacts of the proposed action and analyzed alternatives, and the "alternatives section," which should present a concise comparison of alternatives (based on and summarizing information developed in the "environmental consequences section"). Subsection 6.7 provides some general approaches to alternatives comparisons in both EISs and EAs.

Recommendations

- Address environmental impacts in proportion to their potential significance. That is, focus the impacts analysis and discussion on project attributes that have significant impacts or potential for significant impacts.

- Do not address clearly insignificant impacts in detail, but indicate that all relevant environmental attributes were considered and provide enough information to show why greater consideration is not needed.

6.1 IMPACT IDENTIFICATION AND QUANTIFICATION

Background

CEQ's regulations (40 CFR 1508.8) distinguish between direct and indirect effects. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by the action that occur later in time or farther in distance.

CEQ's regulations (40 CFR 1508.7) define cumulative impacts as those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts analysis captures the effects that result from the proposed action and the effects of other actions taken during the proposed action's duration in the same geographic area.

CEQ's regulations (40 CFR 1502.16) also direct that irreversible and irretrievable commitments of resources be addressed in EISs. These impacts include resource loss (such as the burning of fossil fuel) and forgone resources (i.e., resources that would remain but would be inaccessible or could not be used, such as land and ecosystems inundated by dam construction).

Recommendations: Identifying impact categories for further consideration

- Identify potentially nontrivial impacts.

  Explanation: One problem in documents concerning environmental restoration activities, for example, is the failure to address adverse impacts related to the implementation of a project. To illustrate, if the proposed action is a pump-and-treat groundwater restoration project, the EA or EIS should assess any adverse environmental effects of well installation and effluent discharge on terrestrial and aquatic biota, in addition to the more obvious beneficial effects from groundwater treatment.

- Identify possible indirect d cumulative impacts, and indicate the degree to which these impa , are uncertain.

  Explanation: The classic example of an indirect impact is growth and development that follows the construction of a road or the extension of utility lines. Another example is the installation of a flood control or hydroelectric power dam that might directly interrupt salmon spawning; over time, bald eagles (which feed on salmon) might indirectly suffer from a loss of food supply.

  A graphic example of the importance of considering cumulative effects is the markedly different effects of adding a small amount of liquid to a full glass or a nearly empty one. Similarly, the cumulative effect of taking an action that would increase traffic by a few trucks per day at an already overcrowded intersection is different from the effects of adding the same traffic to a little-used rural crossing. Also, a small loss of habitat from one proposed action, combined with losses from other projects, may produce an overall significant loss of habitat and materially affect the regional biodiversity.

- Address both the total impact from all activities encompassed within a proposed action and the incremental impact of the proposed action when added to other actions (i.e., cumulative impact).

Recommendations: Impact quantification

- Quantify impacts to the extent practicable, consistent with the sliding scale approach.

- Do not attempt to quantify impacts on environmental resources when it is clear from the context that any impacts would be virtually absent. As appropriate, provide a brief negative declaration, such as "The project would not affect threatened or endangered species or their habitats," and provide appropriate references or consultation letters. As this example suggests, not every resource requires a negative declaration, only those sensitive resources at a site.

- Do not just identify pollutants that would be released and wastes that would be produced but, wherever possible, identify potential effects from these substances (e.g., human diseases, and effects on plant and animal populations and ecosystem functions).

  Explanation: Providing a quantified release rate should not be the endpoint in effects analysis. For example, releases into fresh water streams may affect humans who drink the water, alter aquatic invertebrate populations, or accumulate in sediment and ultimately have adverse impacts on benthic invertebrates.

- Provide sufficient data and references to allow review of the validity of analysis methods and results.

- Use available data for an EA. If data needed to quantify impacts are not available, prepare a qualitative description of the most relevant impacts. Be aware that inability to satisfactorily characterize an important impact in an EA likely will render it inadequate to support a finding of no significant impact.

- When confronted with incomplete or unavailable information for an EIS, refer to the requirements of 40 CFR 1502.22.

- Do not use regional, national, or global comparisons to trivialize the significance of a local impact.

  Explanation: Local comparisons may sometimes appropriately provide a context for assessing impact (e.g., withdrawing 10 hectares of agricultural land from use in a county with 10,000 hectares in production of the same crop). However, it would be inappropriate to say "five traffic fatalities would be expected as a result of the project campaign, but this is small compared to the approximately 200,000 traffic fatalities that would be expected to occur nationally during the same period."

- Differentiate among information used to represent baseline conditions (impacts of no action), data that may be used to assess potential cumulative impacts, and information presented merely to provide perspective.

- Recognize that relative comparisons do not provide absolute impact information.

  Explanation: The statement "routine emissions would increase by 0.05 percent" is not a statement describing an impact (although it is a valuable part of the description of the proposed action). The statement provides neither the absolute value of emissions nor the basis for determining their environmental impacts. Further, relative comparisons, particularly those given without a baseline of absolute magnitude, may be misleading (e.g., "99.9% pure water" could describe raw sewage).

- Avoid presenting a description of impacts that are severe without also describing the likelihood of such impacts occurring.

6.2 HUMAN HEALTH EFFECTS

Background

The principal potential human health effect from exposure to low doses of radiation is cancer. Human health effects from exposure to chemicals may be both toxic effects (such as nervous system disorders) and cancer. Exposure and dose are neither health effects nor environmental impacts. A common problem in estimating effects from human exposure to chemicals or radiation is the failure (or inability in some cases) to carry the analysis to completion; that is, to identify, and quantify when appropriate, potentially significant health effects (e.g., number of deaths).

It is appropriate, but not at all sufficient for purposes of analysis, to state that DOE facilities and operators would have to comply with all applicable standards, that exposure to workers and the public would be minimized by using appropriate and approved safeguards and procedures, or that exposure to workers and the public would be maintained as low as reasonably achievable below standards. Where standards are directly relevant to limiting environmental impacts, identify the standards and briefly state their requirements.

Recommendations: Human health effects generally

- Apply the sliding scale approach when characterizing human health effects.

- Determine the period of estimated exposure by how long a project would expose workers or the general public. Typically use 30 years for workers and the public unless a project is clearly expected to be shorter or longer in duration or would expose the public for a full lifetime. Full lifetime exposures could occur, for example, from radioactive material with long half-lives or other long-lived contaminants that are permanently at a site (such as from waste disposal or residual radioactivity or contaminants that persist in soils or groundwater). In cases of potential full lifetime exposure for the public, use 70 years for the period of estimated exposure.

  Analyses generally should be based on realistic exposure conditions. Where conservative assumptions (i.e., those that tend to overstate the risk) are made, describe the degree of conservatism, and characterize the "average" or "probable" exposure conditions if possible.

- Consider all potential routes of exposure, not just the most obvious route.

  Explanation: Where the proposed activities might result in the air suspension of contaminated soils, consider the downwind exposure of the public to suspended particles.

- Aim to provide estimates of potential health effects from chemical or radiological exposure for three subsets of populations and maximally exposed individuals in those populations: (1) workers that would be involved in the proposed action, (2) noninvolved workers (workers that would be on the site of the proposed action but not involved in the action), and (3) members of the general public. Do so for both routine operations and accident scenarios (accidents discussed in subsection 6.4).

- Provide the basis for health effects calculations, as it may be misleading to present only the resulting estimates. As appropriate, present the dose, dose-to-"risk" (health effects) conversion factor, potential health effects calculated for a maximum year and for the total period of estimated exposure, and any other germane information (further discussion below).

Recommendations: Carcinogenic effects from radiation exposure

- When providing quantitative estimates of carcinogenic effects of radiation exposure, express population (or collective) effects as an estimated number of fatal cancers, and express maximum individual effects as the estimated maximum probability of the death of an individual. Evaluate effects for involved workers, noninvolved workers, and the general public under both routine operations and accident scenarios.

- When providing quantitative estimates of impacts, always use current dose-to-risk conversion factors that have been adopted by cognizant health and environmental protection agencies, such as the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA), and identify the conversion factors being used. Note that conversion factors are occasionally revised to incorporate new experimental and epidemiological information.

  Explanation: As of May 1993, the dose-to-risk conversion factors that should be used for estimating cancer deaths from exposure to low dose rates of ionizing radiation are 500 cancer deaths (latent cancer fatalities) per million person-rem effective dose equivalent (5×10^{-4} deaths per person-rem) for the general population and 400 cancer deaths per million person-rem (4×10^{-4} deaths per person-rem) for workers (NRC, Preamble to Standards for Protection Against Radiation, 56 FR 23363, May 21, 1991). The difference is attributable to the presence of children in the general population.

- Use statements about background or natural sources of radiation judiciously, to help explain the impacts but not to suggest that the impacts are acceptable. Do not assert that the average annual effective dose equivalent caused by a project translates to an insignificant increase in risk simply because it constitutes only a small increase above background. Present information in relation to standards and allow readers to make their own judgments.

  Explanation: The average annual effective dose equivalent individuals receive from naturally occurring radiation, or some other point of reference (e.g., airplane travel), might provide readers perspective on doses estimated for the proposed action. Impacts from the proposed actions would occur independently of impacts from natural background radiation, however, and the text should not imply that background radiation provides a basis for judging the significance of the impacts of the proposed action.

- Always define "risk" when using the term and provide the context for its use. If "risk" or "probability" is used in describing potential effects, be certain to state the effect the probability describes, e.g., the probability of cancer death, probability of high dose rate, or probability of a particular accident scenario.

  Explanation: "Risk" is used in discussions of health effects with wide variation in meaning. Although "risk" sometimes indicates a general statement of concern or hazard or danger, the term also is used to denote uncertainty or chance or probability, or even effects themselves, often with a numerical (or algebraic) presentation.

- Based on the sliding scale approach, the assessment of health effects from occupational radiation exposures in EAs usually need not be as extensive as the assessment in EISs. The fact that such exposures are subject to limits and must be maintained as low as reasonably achievable (under DOE Orders) does not itself demonstrate that the effects on workers' health (from the project or cumulatively with other exposures) are insignificant. DOE's experience indicates, however, that many EA-level proposed actions pose worker health issues that do not warrant thorough examination in the NEPA context. For *small-scale* projects (in terms of worker exposure to radiation), the following discussion may serve as a model description of the health effects from occupational radiation exposure from normal operations.

  Worker exposures to radiation under normal operations would be controlled under established procedures that require doses to be kept as low as reasonably achievable and that limit any individual's dose to less than 5 rem per year. Based on relevant experience with other projects, DOE expects the average dose from this proposed project to be maintained below _____. [Give an appropriate dose that is substantially below 1 rem if this model is to be used; e.g., 0.1 rem.] The cumulative worker dose would not exceed _____ person-rem. [Obtain the result by multiplying: average annual dose (rem, from the previous sentence) times the average number of workers being exposed at one time times the operational life of the project (years). Use this model only if the result is well below 1,000 person-rem.] Based on an occupational risk factor of 4 x 10^{-4} fatal cancers per person-rem, workers engaged in this proposed project would not be expected to incur any harmful health effects from radiation exposures they receive during normal operations.

Explanation: This discussion is based on an occupational risk factor of 4×10^{-4} fatal cancers per person-rem, or 1 fatal cancer per 2,500 person-rem. Assuming a project lifetime of about 30 years, this implies that a project that would deliver approximately 100 person-rem per year would be expected to produce approximately one fatal cancer induced by occupational radiation exposure over the duration of the proposed project. (A project involving 100 workers that receive an average individual dose of 1 rem per year would produce 100 person-rem per year.)

The foregoing discussion does not imply and should not be inferred to constitute a position regarding the "significance" (in the NEPA sense) of any exposure level or number of health effects. Rather, it suggests general circumstances under which occupational radiation exposure may not warrant *thorough* examination in an EA.

The model description suggested above may be used when exposures are confidently projected to be below the levels indicated -- the farther below, the more appropriate the simple approach becomes -- and when there are no substantial counterindications to its use. The following are examples of such counterindications: (1) the exposure estimates are unusually uncertain, such as when workers would be operating under conditions for which there is little relevant experience; or (2) there is a high level of interest regarding the proposed action in which occupational radiation risk might be an issue.

- For EISs, or for EAs for which the counterindications discussed above exist, include more complete statements of health effects, such as in the following example for involved workers.

  Example: Based on a dose-to-risk conversion factor of 4×10^{-4} latent cancer fatalities per person-rem, the maximally exposed worker (dose rate of 1 rem per year) would have an estimated annual probability of a fatal cancer induced by the radiation of 4×10^{-4}. The estimated probability of the worker dying from cancer induced by such radiation doses over the worker's projected exposure period (30 years) is approximately 1×10^{-2} (or 1 chance in 100).

  The group of 200 workers are estimated to be exposed at an average dose rate of 50 mrem/year. Assuming the group is exposed at this rate for 30 years, the estimated number of fatal cancers induced among the workers would be 0.1. It is most likely there would be no fatal cancers attributable to this exposure.

Recommendations: Effects from chemical exposure

- As appropriate, and as discussed generally above, evaluate toxic and carcinogenic health effects from exposure to hazardous chemicals for involved and noninvolved workers and the general public. For toxic effects, compare dose estimates with appropriate reference doses. For carcinogenic effects, calculate values for potential carcinogenic effects from dose estimates using appropriate dose-effect relationships.

- As appropriate data permit, evaluate acute toxicity, chronic health effects, cancer, and occurrence of inheritable mutations, and address cumulative or synergistic health effects from exposure to multiple chemicals.

- If reference doses or dose-effect relationships are not available, use reference concentrations, Occupational Safety and Health Administration permissible exposure limits, or other criteria that may be available in such sources as EPA's Integrated Risk Information System database or the National Library of Medicine's MEDLAR database.

6.3 TRANSPORTATION IMPACTS

Background

When transport of waste or materials of a hazardous or radioactive nature is a necessary part of a proposed action or analyzed alternative, or, more generally, when transport is in any respect a major factor (e.g., transportation of construction materials for a proposed major dam), the environmental impacts of such transport should be analyzed, even when DOE is not responsible for the transportation. Transportation impacts include those from transport to a site, on-site, and from a site, when such activities are reasonably construed as part of the proposed action or analyzed alternative. If not otherwise analyzed, include any necessary loading or unloading activities in the transportation impact analysis.

As with the choice of alternatives, apply a sliding scale approach to the transportation analysis. The nature of the proposed action and analyzed alternatives determines whether to describe the transportation impacts qualitatively or to analyze them quantitatively, and what types of potential transportation accidents to consider (see subsection 6.4).

Recommendations

- Analyze all transportation links that are reasonably foreseeable parts of the proposed action or analyzed alternative, such as overland transport, port transfer, and marine transport. If the action contains links that traverse the global commons (e.g., the oceans or outer space), then impacts from such transport should be included in the NEPA analysis; state that the global commons analysis is provided pursuant to Executive Order 12114.

- Do not rely exclusively on statements that transportation would be conducted in accordance with all applicable regulations or requirements of the U.S. Department of Transportation, the Environmental Protection Agency, the Nuclear Regulatory Commission, or State authorities.

- Evaluate both routine (i.e., incident-free) transport and accidents. (Accidents are discussed in subsection 6.4.) Give special emphasis to public or worker health impacts from exposure to chemicals or radiation.

- Be sure to use defensible estimation methods for assessing the radiological impacts of transportation (such as the most current version of RADTRAN).

- Estimate the annual and total impact of all DOE and non-DOE transportation associated with the use of specific routes (if known) over the term of the proposed action or analyzed alternative, including, for chemical and radiological exposure, the impact on a maximally exposed individual. The impacts of the proposed action related to transportation must be totaled over the duration of the project (e.g., 48 trips per year for 5 years). (Note: This total is not the cumulative impact of transportation impacts from the proposed action and other transportation activities over the same time period in the same area.)

- In determining the cumulative impact from transportation activities, use available data to estimate, for example, the number of radioactive materials packages that were shipped over a given transportation system over a given period of time.

6.4 ACCIDENT ANALYSIS

Background

This section deals with environmental impacts that will not necessarily occur under a proposed action, but which are reasonably foreseeable. The term "reasonably foreseeable" has no precise definition. Its interpretation should be guided by *two primary purposes* of NEPA review: (1) to determine whether a proposed action has the potential for significant impacts (EA), and (2) to inform an agency (and the public) in making reasonable choices among alternatives (EA and EIS).

For both purposes above, "reasonably foreseeable" includes impacts that may have very large or catastrophic consequences, even if their probability of occurrence is low, provided that the impact analysis is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason. Note, however, that a high-consequence event would not necessarily have "significant impacts" (in the sense of NEPA) if its probability of occurrence is very low. (The probability referred to in these discussions is the probability of the consequences of the accident or failure scenario occurring, not the probability of the initiating event occurring.)

EAs normally deal with proposed actions and analyzed alternatives that would not have potential for significant adverse impacts even under accident conditions. In contrast, EISs normally deal with larger scale projects that may have such potential. As with the choice of alternatives and the analysis of environmental impacts, use a sliding scale approach in considering impacts from potential accidents (or abnormal events). The nature of the proposed action or analyzed alternatives determines what types of potential accidents to consider, whether to describe impacts from accidents qualitatively or to analyze them quantitatively, and to what extent to consider very low probability events. Analyze impacts from reasonably foreseeable accidents to about the same extent as other impacts from the proposed action or analyzed alternatives, or even to a greater extent where impacts from accidents are the dominant concern.

Recommendations: Steps for determining which accident scenarios to analyze

- Identify the spectrum of potential accident scenarios (e.g., fire, impact or puncture events, HEPA filter failure) that could occur during construction, operations, and transportation activities encompassed by the proposed action and analyzed alternatives. Also identify failure scenarios from natural events (e.g., tornados, earthquakes) and human error (e.g., forklift accidents).

For a proposed action that involves a facility or component with a set of design basis criteria (DOE 6[illegible].1A), consider the following two major categories of accidents.

> *Within design basis:* First focus on accident, failure, or error scenarios within the design basis and determine the type of event that is likely to cause the greatest consequences, supporting that determination with rough estimates of or qualitative judgments about the magnitude of the consequences. Typically, these events will have probabilities of greater than 10^{-6} per year, especially for natural phenomenon events.
>
> *Beyond design basis:* Look beyond design basis to see if there may be events of such large consequences that they need to be considered in order to satisfy the primary purposes of NEPA review as stated in the first paragraph in this section. Generally, examine the probability range 10^{-6} to 10^{-7} per year to the degree that events within this range bear on satisfying the two primary purposes of NEPA review cited above. As a practical matter (including litigation history), events with probabilities less than 10^{-7} per year will rarely need to be examined.

- Describe events that have very small consequences only qualitatively in the NEPA review, regardless of the probabilities.

- For events whose consequences are relatively low and numerical probability estimates are unavailable or difficult to obtain, qualitative descriptions such as "very infrequent" or "highly unlikely" may be used, provided that the basis for such a conclusion is described.

- Analyze events that have large consequences in terms of both their probabilities and consequences. If it is not possible to determine the probability with much certainty, use a range of probabilities.

- The term "consequence" refers to the results of an accident without consideration of the probability of the accident. Often, the product of probability and consequence, referred to as "risk," is provided as a measure of impact, but this product is not as informative as a presentation of its separate factors and is not the only definition of "risk."

Recommendations: Factors to consider in accident impact analysis

- Consider impacts on the public and on workers.
- Consider synergistic effects with nearby facilities, chemical as well as radiological.
- Consider common mode failures, including external initiators (such as earthquakes).
- Reference Safety Assessments and Safety Analysis Reports, if available.

6.5 COMPLIANCE WITH OTHER REGULATIONS

Background

As a practical matter, all proposed actions must comply with applicable requirements, yet some actions nevertheless would have very large and significant environmental impacts (e.g., major construction projects). A statement that the proposed action or analyzed alternatives would be in compliance with applicable environmental regulations, DOE Orders, or licenses does not substitute for a presentation of impacts.

Recommendations

- Rather than just stating that "all wastes would be disposed of in accordance with applicable regulatory requirements and DOE Orders," demonstrate (e.g., document by reference) that the existing disposal site has adequate capacity and is permitted to receive the waste type. If impacts from proposed disposal of waste at an existing site would threaten to violate a standard (i.e., have potential for significant impact), take the analysis further and estimate impacts. A judgment of significance of impacts includes a consideration of "threats" to standards (40 CFR 1508.27(b)(10)).

- Do not rely on compliance with environmental discharge permits (such as National Pollutant Discharge and Elimination System or air emissions permits) as the only evidence that a proposed action or analyzed alternative does not have potential for significant impact. Evaluate incremental inputs cumulatively with other discharges to the receiving environment (e.g., air, soil, groundwater, surface water).

  Also, consider the quality of the receiving environment. A proposed action that would change a relatively pristine area to one where pollutant levels were near limits (e.g., an action that could cause "significant deterioration") would be an action with potential for significant impacts.

  > Explanation: A potential violation of laws, regulations, and standards may indicate a potential for significant impacts, but compliance does not establish insignificance.

6.6 CONCLUSIONS

Recommendations

- Make sure that conclusions follow from the analysis presented in the EA or EIS. Do not state bald or unsubstantiated conclusions.

- Provide sufficient information to support a technical review of the analysis and conclusions. This can often be accomplished by citing appropriate references or providing detailed technical information in an appendix.

- Explain the cause-and-effect relationship between an action and its impacts; do not simply provide the end result.

  > Example: The loss of bald eagle food supply may be an indirect impact of dam construction, but without an explanation of the relationship of the dam to salmon spawning, the reason why dam construction might affect the bald eagle may not be clear to a nonspecialist.

6.7 COMPARISON OF IMPACTS IN ENVIRONMENTAL IMPACT STATEMENTS

Recommendations

- Present the impacts of alternatives in comparative form to sharply define the issues and provide a clear basis for choice (40 CFR 1502.14). Use tables when appropriate.
- Conduct analysis to discriminate among alternatives. Do not present bounding impact estimates that obscure differences among alternatives.
- Present enough information to allow readers to evaluate the differences among alternatives. Avoid bias for or against alternatives. Do not simply restate impacts presented in the environmental impacts section.

7. LIST OF PREPARERS AND LIST OF AGENCIES AND PERSONS CONSULTED

Background

An EIS (but not an EA) is required to list the names and qualifications (expertise, experience, and professional disciplines) of persons who were primarily responsible for preparing the EIS or significant background papers (40 CFR 1502.17). An EA must contain a list of outside agencies and persons consulted (i.e., those outside DOE and its contractors) during preparation of the document (40 CFR 1508.9(b)). Conflict-of-interest considerations (40 CFR 1506.5(c)) apply to preparation of an EIS but not to preparation of an EA.

Recommendations

- Do not list DOE or contractor personnel who prepare an EA or who are consulted during its preparation in the list of outside agencies and persons consulted.
- Indicate DOE (not a contractor) as the preparer on the title page of an EA or EIS.

8. APPENDICES

Background

CEQ's regulations discuss the use of an appendix in an EIS (40 CFR 1502.18). In general, there will be less need for and use of appendices in EAs than in EISs because DOE generally prepares EAs for actions that appear at the onset to be without potential for significant impact. CEQ defines an EA to be a "concise" rather than a "detailed" assessment.

Recommendations

- Use appendices to support the content and conclusions contained in the main body of an EIS, or EA when necessary.
- Provide supporting information that reviewers may want to examine, such as details of the modeling methodology, in an appendix. As a general rule, however, do not put raw data in an appendix, unless the data are critical for analytical validation.
- Make information in an appendix consistent with information in the main body of the EIS or EA. Similarly, limit appendices to information that supports discussions in the main body.
- Provide analyses prepared under related environmental review requirements (e.g., a biological assessment prepared for endangered species) in an appendix (and include a brief summary in the impacts section of the EA or EIS). Also include official communications related to environmentally sensitive resources in appendices.

9. GENERAL DOCUMENT QUALITY/READER FRIENDLINESS

Background

A key challenge in preparing readable NEPA documents is to present technical material in language that a lay person can understand. CEQ's regulations require that EISs be written in plain language and suggest appropriate graphics so that decisionmakers and the public can readily understand them (40 CFR 1502.8). The same editorial principles should also be applied to EAs.

Recommendations

- Write documents to inform, not intimidate, the interested public.
- When necessary, achieve a balance between using plain language and accurately portraying the technical complexity of issues.

9.1 GRAPHICS AND DATA TREATMENT (UNITS, STATISTICS)

Recommendations: Graphics and tables

- Use easy-to-follow graphics and tables to summarize data, show correlations, and facilitate readers' access to information. Take care that graphics and tables inform and do not confuse the reader.
- Select axes for graphs to avoid misleading representations.

  Explanation: Do not use an enlarged scale to minimize the visual impact of a parameter value. The default graphing scale of various computer graphics software packages often result in inappropriate choices.

- Plot graphs that may be compared to one another on the same axes and scales whenever possible.
- Avoid data graphs with axes that begin at a value other than zero, or construct such graphs carefully so as to avoid misleading the reader.
- Use maps and drawings to depict all features that are needed to understand the project and its impacts; provide directional arrows and scale indicators.

- Do not include extraneous information, such as irrelevant contour lines.

- Make maps and other figures consistent with the text.

Recommendations: Units

- Use consistent, relevant, and conventional units in tables, graphics, and text.

- Use the metric system to the extent possible. See DOE N 5900.3 and DOE 5900.2A concerning use of the metric system. When the metric system is used, also include conventional (English) units to ensure public understanding.

- Use authoritative sources for conversion factors, such as a recent edition of the Chemical Rubber Company *Handbook of Chemistry and Physics.*

- Avoid misplaced decimal points.

- Use units that facilitate comparisons and understanding.

  Examples: In comparing emissions to standards, display both emissions and standards in the same units. Use 5 parts per billion, not 0.000005 parts per thousand.

- If scientific notation is used, provide an explanation.

- Use appropriate significant figures.

  Examples: "Three feet" is more correctly converted to "about one meter" than to "0.914 meters." Use 0.5 person-rem rather than 0.478 person-rem when the dose is really known or estimated to only one significant figure, which is usually the case in NEPA assessments.

- Use consistent units throughout a document and appendices whenever possible.

Recommendations: Statistics

- Avoid misleading use of statistics, mixing cause and effect, and implying causation from correlation.

  Example: It was suggested recently that low-level radiation exposure limits should be lowered because a study of workers at Oak Ridge National Laboratory found a statistical correlation between long-term low-level exposure to ionizing radiation and risk of death from all types of cancer. However, no biological cause and effect was demonstrated nor was there control for other potential risk factors. Thus, although a correlation has been shown, cause and effect has not been demonstrated.

- Avoid use of an inappropriate statistic.

  Explanation: In some cases, using a range of values, the maximum or minimum value, or even all the data (e.g., presented graphically) may be more meaningful than using the arithmetic mean. For example, if a contaminant concentration has been measured twice with values of 10 and 1,000, the arithmetic mean value does not adequately characterize the situation, and it would be better to report both measurements. For some data (such as aquifer permeability, atmospheric pollutant concentration, coliform bacteria counts, or other data that span orders of magnitude), geometric means are more representative than arithmetic means.

9.2 WRITING QUALITY

Recommendations

- Use technical writers and editors to help identify unclear passages, undefined terms, and unsupported conclusions, and generally improve the presentation of material.

- Write precisely and concisely. Use plain language. Avoid jargon.

- Define technical terms that may be unfamiliar to a lay person. Provide a glossary when many specialized terms are used. Define terms such as "risk" (which may have a different meaning in a technical sense than in a colloquial sense) in the context of the document.

- Use regulatory terms consistent with their regulatory definitions.

  Explanation: Terms involving "toxic" and "hazardous" (such as hazardous material, hazardous substance, extremely hazardous substance, hazardous chemical, hazardous waste, and toxic waste) are frequently misused.

- Provide scientific names for biota, including the subspecies or variety name if appropriate (particularly for endangered, threatened, or protected species), in addition to common names, to avoid confusion and ambiguity.

- Do not rely solely on the "spell check" function of word processing programs to check for spelling errors. Correctly spelled words are often used incorrectly.

- When in doubt about the proper use of a word, grammar, or spelling, use the *Government Printing Office Style Manual*, which also provides guidance on document format, organization, and references.

9.3 REFERENCES

Recommendations

- As discussed in Section 6, always provide sufficient information to support a technical review of assumptions, methodologies, and conclusions, and in doing so, cite references that are publicly available.

- If an analysis is not available for review, present sufficient information in the EIS or EA to verify the conclusions of the analysis and place supporting analyses in an appendix. (If the supporting analyses are classified, place them in a classified appendix.)

- Cite personal communications or "unpublished file data" only as sources of information, not as support for conclusions regarding the significance of impacts.

  Explanation: A personal communication with a local official may be cited as the source of information for traffic volume on a particular highway but could not be cited for an analysis of increased fatalities expected per increased volume of traffic.

- Cite draft documents only if the documents have attained relatively high review or approval within the issuing organization.

9.4 OBJECTIVITY

Recommendations

- Remember that while EAs and EISs support decisions, they are pre-decisional documents and should not indicate that a decision has been made.

  Example: Use conditional wording and verb tense, such as "would" rather than "will," in action descriptions.

- Use language that is objective and descriptive, not judgmental, particularly with regard to the significance of impacts.

  Example: Do not characterize impacts as "acceptable." Present impact data and any applicable or relevant standards for the reader to form judgments. Use quantitative comparisons or words such as "very small" or "substantial," if necessary, to describe impacts.

- In EAs, do not use the word "significant" or "insignificant" in conclusory statements. Conclusions of overall insignificance or significance will be made in a finding of no significant impact or a determination to prepare an EIS.

- Avoid tone and nuance that are not objective.

  Explanation: Do not subtly play down alternatives that DOE does not prefer when responding to public comments and in discussing responsible opposing views. Provide professional, authoritative, and dispassionate responses, not casual or flip responses.