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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Attendance at Professional Development Training: Cumulative Effects Assessment
20.01402.158

DATE/PLACE: November 3–5, 1999, Irving, Texas

AUTHOR: P. Mackin

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PERSONS PRESENT: Author and nine attendees from a variety of governmental agencies, commercial firms, and one foreign country

BACKGROUND AND PURPOSE OF TRIP:

This training was attended as a professional development opportunity for the author. The training was presented by Drs. Larry Canter and Sam Atkinson, who have previously provided environmental assessment training to Center for Nuclear Waste Regulatory Analyses (CNWRA) and Nuclear Regulatory Commission (NRC) staff. Drs. Canter and Atkinson are also currently employed as consultants to the CNWRA to support the review of the Yucca Mountain Draft Environmental Impact Statement (EIS). This cumulative effects assessment (CEA) course is a new addition to the series of courses taught by Drs. Canter and Atkinson. Participation in this course was intended to provide expertise to support further CNWRA work in environmental impact assessment.

SUMMARY OF PERTINENT POINTS:

Not applicable.

SUMMARY OF ACTIVITIES:

The course was based on textual material provided by the instructors titled, "Cumulative Effects Assessment". The following paragraphs summarize the material presented in each chapter of the textual material.

Chapter 1, Introduction, summarized the requirements for CEA. The instructors noted that Council on Environmental Quality (CEQ) regulations have always required CEA in evaluating the impacts of proposed actions on the environment. However, from the time of passage of the National Environmental Policy Act

(NEPA) until the present, practitioners have only gradually learned how to conduct CEA. Chapter 1 summarizes various definitions of the term CEA and gives examples from both U.S. and foreign applications. The chapter ends with a summary of the principles of CEA which are

(i) Cumulative effects are caused by the aggregate impacts of past, present, and reasonably foreseeable future actions

(ii) Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, or human community, of all actions taken

(iii) Cumulative effects should be analyzed for specific resources, ecosystems, and human communities

(iv) The set of environmental effects to be considered must focus on those that are truly meaningful

(v) Cumulative effects are rarely aligned with political or administrative boundaries

(vi) Cumulative effects may result from the accumulation of similar effects or from the synergistic interaction of different effects

(vii) Cumulative effects may last well beyond the life of the action that caused the effect

(viii) Each effected resource, ecosystem, and human community must be analyzed in terms of its carrying capacity to accommodate additional impacts

Chapter 2 of the course material discusses procedures for CEA. The conceptual framework for a CEA typically includes three components: (i) a cause or source of change, (ii) the process of change, and (iii) the results of the change. Chapter 2 provides a number of practical approaches to conducting CEA. CEQ identifies the following steps that could be used to conduct a CEA:

(1) Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

(2) Establish the geographic scope of the analysis.

(3) Establish the timeframe for the analysis.

(4) Identify other actions affecting the resources, ecosystems, and human communities of concern.

(5) Characterize the resources, ecosystems, and human communities in terms of their response to changes and capacity to withstand stresses.

(6) Characterize the stresses affecting the resources, ecosystems, and human communities and their relation to regulatory or numerical thresholds.

(7) Develop a baseline condition for the resources, ecosystems, and human communities.

(8) Identify important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

(9) Determine the magnitude and significance of cumulative effects.

(10) Modify or add alternatives to avoid, minimize, or mitigate cumulative effects.

(11) Monitor cumulative effects.

(12) Develop a management plan.

The text stresses that for a particular project, practitioners must be flexible in using these steps and in determining when they should be iterated.

Chapter 2 includes a discussion of three applications of CEA and provides the chief findings from these applications. The material in chapter 2 concludes by noting that the environmental impact assessment process has typically focused on a project and its resultant consequences. The text contrasted this with an acceptable CEA in which the focus is on specific resources and the effects of the proposed action , as well as other past, present, and reasonably foreseeable future projects on the resource.

Chapter 3 of the text addresses special issues in CEA. The first of these issues is delineating the spatial boundaries for the CEA. The course material stresses that the spatial boundaries of impacts for a proposed action seldom match human-determined jurisdictional or administrative boundaries. The second issue is the need to delineate temporal boundaries. This requires specifying a starting time for which cumulative effects are to be assessed. Determining this time is often difficult because historical data on the original condition of resources may not be available. The instructors stressed that a rationale for the selected starting time must be provided in a CEA. The third issue is how to determine reasonably foreseeable actions. The text provides several practical approaches to identifying reasonably foreseeable future actions which have been successful. The fourth issue is establishing baseline conditions. The instructors stressed that baseline has often been considered to be the status quo. However, for CEA, baseline ideally is the condition of resources when they were pristine or before they were affected by human actions. The instructors noted that it is often impossible to define the baseline conditions under these criteria and that a practitioner must select a baseline condition and then provide the rationale for the selection. The last issue is determining the significance of cumulative effects. The text provides practical approaches for determining the significance. What is most important is to make decisions that are documented and that are reasonable. The primary point of chapter 3 is that there are pragmatic approaches that can be used to address these issues.

Chapter 4 discusses scoping for CEA. Scoping refers to an early and open process for identifying the important issues related to a proposed action. Scoping requires identifying the range of actions, alternatives, and impacts that would be associated with the action. The text discusses means of obtaining input from appropriate stakeholders. It briefly discusses pragmatic considerations for a scoping program including when to start, preparation of information packets for participants, forms to be used for the scoping, issuing public notices, means for conducting public meetings, determining how to deal with resulting comments, allocating work assignments, and establishing schedules. The text contains sources of information for conducting a CEA. It also presents criteria for prioritizing issues to be addressed from a scoping program. The chapter ends by identifying four lessons relating to scoping activities. The first is that the scoping process should be considered an opportunity to gather pertinent information rather than as bureaucratic requirement to be met.

The second lesson is that scoping should be tailored to the type of action, the location, and the potentially affected stakeholders. The third lesson is that inputs received during scoping should be prioritized. The fourth lesson is that decisions taken from the scoping process should be well documented. The resulting EIS or environmental assessment (EA) must document how issues identified during scoping were addressed.

Chapter 5 of the course presents methods for CEA. It has sections on the desirable characteristics of methods, comparative reviews of methods, and examples of methods used in past CEA studies. The chapter also provides information on selecting a method for conducting a specific CEA. Six useful criteria for method selection are:

(1) Methods should be able to incorporate effects over time.

(2) Methods should be able to assess impacts that are spatially distributed.

(3) Methods should be able to assess different types of impacts on a given resource.

(4) Methods should be able to identify or assess the accumulation of impacts in relationships that link cause and effect.

(5) Methods should be able to assess alterations to processes such as energy flows, nutrient cycling, or species succession.

(6) Methods should be able to assess such effects as structural changes in populations or habitat modifications.

The comparative reviews of CEA methods reveal that different methods are useful for different types of projects. There are no clearly superior methods. However, the author noted that simpler methods have the most widespread usage. Chapter 5 also presents examples of CEA methods that have been used successfully including checklists, matrices, and dynamic models. Other types of methods used for CEA include spatial analysis, ecological modeling, monitoring, and expert opinion. Examples of the use of various of these methods are provided as practical applications. The authors stressed the importance, regardless of what method is selected, of using a decision methodology in CEA so that the approach is systematic, provides a rational framework, can be used to document the selection process, provides an audit trail, and can be used to demonstrate tradeoffs among candidate methods.

Chapter 6 discusses prediction methods for cumulative effects. The chapter presents many methods and contrasts and compares them in a variety of ways. One systematic grouping of these methods includes experimental methods, mathematical models, and survey techniques. Another classification includes simple techniques, indexes, experimental methods, and mathematical models. Yet another classification groups the methods by resource area (e.g., air, surface water, groundwater, biological, historical, and archeological). These methods often overlap and it was made clear in the course that a specific project will require tailoring of CEA methods. An example was used to demonstrate assessment of cumulative effects on air quality using a variety of methods. Other examples assessed impacts on habitat and impacts associated with a hydroelectric project. All methods are within the scope of CNWRA and NRC capabilities.

Chapter 7 discusses strategic environmental assessment and cumulative effects considerations. The instructors noted that environmental impact assessment has typically been associated with individual projects

or proposed actions. However, they also noted that there is increasing emphasis on CEA for programmatic or strategic EISs. The chapter addresses methods for conducting CEAs for policies, plans, and programs. The instructors stated that a strategic assessment generally covers activities of greater temporal and spatial scales and that the assessments are typically conducted at a higher level and with greater uncertainty than is the case for a project assessment. The strategic EA requirements of various countries were covered, providing comparison with EAs conducted in the U.S. A number of case studies were discussed. It was noted that strategic CEAs are used to strengthen a project-level environmental impact assessment, to address cumulative and large-scale effects, and to incorporate smaller-scale considerations into high-level decision making. The chapter includes discussion of the specific problems associated with conducting strategic EAs including the lack of data, the larger boundaries, and the critical nature of the decision making processes.

Chapter 8 presents case studies. These case studies were at different scales and emphasized different aspects of CEA, but all were useful as examples of how the principles covered in the course could be applied. In addition, three of the students presented projects that they were currently working on. The author discussed the Yucca Mountain Draft EIS at some length as one of the three examples selected from the class.

Chapter 9 presents an air-quality CEA as a practical example. This example used a number of techniques to assess the impacts on air quality of a specific action and provided a useful example that built upon the course material.

Chapter 10 of the course discusses effluent trading programs. This chapter was not emphasized in the class and will not be discussed further.

Chapter 11 addresses monitoring of cumulative effects. The course discussed the purposes of cumulative effects monitoring, the planning considerations for monitoring programs, and four examples. The text proposes that a comprehensive monitoring program for cumulative effects should be required of all major projects as part of their life cycle. The instructors stated that purposes of cumulative effects monitoring include providing supporting documentation of cumulative effects; warning of unanticipated adverse effects; identifying a point at which a preselected level of an effect is reached; supporting the timing, location, and level of cumulative effects; providing information for evaluating the effectiveness of mitigation measures; and identifying the level of predicted effects. Case studies of cumulative effects monitoring were presented.

Chapter 12 discusses mitigation of cumulative effects and focuses on biodiversity in ecosystem management. The chapter emphasizes the importance of maintaining biodiversity and its relationship to the environmental impact assessment process. It includes specific examples where effects of actions on biodiversity have been documented and presents concerns and obstacles related to maintaining biodiversity. The text includes recommendations for improvement in this area. The instructors discussed the principles of ecosystem management and provided examples and a discussion of the key challenges to practical ecosystem management, which include hazard identification, risk assessment, implementation, monitoring, and risk communication.

Chapter 13 identifies computer-based sources for information. It provides a substantial list of information sources available to support CEA and environmental impact assessment.

Chapter 14 summarizes the barriers to CEA, provides a summary of guidelines for conducting CEA, and discusses research needs.

Finally, the course material includes six workshops on CEA case studies, which were used throughout the course to emphasize the key instructional points. Course materials may be obtained from the author.

IMPRESSIONS/CONCLUSIONS:

The CEA course conducted by Drs. Cantor and Atkinson is excellent in that it provides practical background and techniques that may be used for CEA. It appears to be directly applicable to future potential NRC and CNWRA work in this area. The author recommends that additional NRC and CNWRA staff attend this course.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.

RECOMMENDATIONS:

This course should be considered as a professional development opportunity for additional CNWRA and NRC staff involved in environmental impact assessment or in the development or review of EISs and EAs.

SIGNATURE:

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