5

DRAFT

January 12, 1981

TECHNOLOGY ASSESSMENT METHODOLOGY AND MANAGEMENT PRACTICES

Task # 1

Comments on the OTA Function: Methodological Modes

by

Lynne Filderman
Louis H. Mayo

Under OTA Contract No. 033-4740.0

Task Force Reports

The George Washington University
Program of Policy Studies in Science and Technology

; Jan 12, 1981, 112 p

TABLE OF CONTENTS

page

I. Technology Assessment in Practice..... 1

A. The OTA Function..... 1
B. The Diversity of Assessment Task-Objectives..... 4

II. The Analytical Mode of Assessment..... 7

A. A General Construct..... 7
B. Adequacy of Performance in Assessment Contexts Dealing With Proposed Actions Posed in Instrumental Form..... 10

APPENDIX TO PART II

III. The Concern Approach to Anticipatory Assessment..... 17

A. Features of the Concern Approach..... 17
B. Criteria of Adequacy of Performance..... 19
C. Explication of Concerns by Estimating the Potential Difficulty of Norm Resolution..... 24

IV. The Legal/Institutional Focus to Assessment..... 32

APPENDIX A TO PART IV

APPENDIX B TO PART IV

V. An Illustrative Framework for Evaluating OTA Studies..... 39

VI. OTA Study on Cost Effectiveness of Medical Technology..... 51

VII. OTA East-West Trade Study..... 57

VIII. OTA Study on Environmental Contaminants in Food..... 68

IX. OTA Study on Energy from Biological Processes..... 89

X. Comments and Questions Concerning Studies by OTA.....

OTA TASK #1 - COMMENTS ON THE OTA FUNCTION: METHODOLOGICAL MODES

I. Technology Assessment in Practice

A. The OTA Function

The basic nature of the OTA function involves the analysis of many existing and potential applications of technology. The latter category of studies, being anticipatory or future-oriented, are eminently susceptible to "second-guessing." Further, the tasks examined may potentially affect many stake-holders as reflected in the scope and diversity of legislative constituencies. However "unbiased" and even-handed OTA may try to be and in fact be, criticism will be a continuing condition. Hence, it is incumbent upon OTA to give careful attention both to the utility of its general mission and to the credibility of its assessment performance. OTA has the burden of continually justifying its basic mission and of defending its particular studies. The establishment over time of OTA as a useful and credible analytical unit will surely be a favorable condition to user evaluation of its specific study outcomes.

It is evident that the Director and staff of OTA have, since its establishment in 1972, given much thought to the role and status of OTA in the public decision process. In this connection, however, it is helpful to review the situation occasionally by posing a set of simple questions: 1) What must OTA do in order to assure minimum viability?; 2) What does OTA as an entity want to do with respect to functions and outcomes?; 3) What cannot OTA do for reason of various constraints? and 4) What can OTA do within the context of conditions identified by the first three questions?

These questions involve an appraisal of numerous factors including: mandate for OTA; the resources available to OTA including methodological rationales and skills; the institutional structure of OTA at the general

and project level; any significant formal or informal constraints on OTA functions and operations; the demands of the Congress and of other constituencies affecting OTA; and the perception of OTA (as an entity) of its mission and aspirations.

This particular exercise goes primarily to a review of OTA methodology. Hence, it is not appropriate to attempt to analyze in any detail the foregoing questions. OTA is no doubt now doing what it must do and more broadly can do. But a question pertinent to the present inquiry is that of the adequacy of its methodologies and outcomes. This question must begin with OTA's position as to what it is attempting to achieve, i.e., its objective or objectives. Adequacy of performance can be appropriately judged only against the relevant goals of an activity. While some may assert that the process is in and of itself important, the users of OTA efforts will no doubt focus on the utility of the outcomes of studies. So what is OTA attempting to do? For example, is the objective to develop the fullest information on an assigned topic? Or is it to sharpen the more critical issues expected to arise in the evolving context and thereby "structure" the continuing debate? Or is it to resolve or ameliorate as many of the issues as practicable, that is, to create the conditions for consensus or compromise? Or is the primary objective in every task selected or assigned to present feasible options (and likely consequences) for Congressional action -- or inaction? If none of the above, then what are the objectives sought by OTA? Does the objective of the study vary with the study -- with the assessment task-objective selected or assigned? Must OTA employ a cluster of objectives? If so, then how does this affect the methodology employed and the criteria of adequacy applied in measuring performance? Must OTA necessarily work with patterns of tasks rather than with a more or less standardized approach to its assessment tasks?

The OTA function might also be thought of in terms of users of its reports. While Congress is the primary audience, the Congress as such surely does not circumscribe the limits of interest in OTA activities. Who reads and acts on OTA reports? Technology Assessment Board? OTA Advisory Board? Project Advisory Panels? Interested Congressmen? Committee and Sub-Committee Chairmen? Committee Staff Members? Other governmental as well as private sector entities surely have an interest in particular reports. It must be in the interest of Congress or of individual Congressmen to have specific reports widely distributed. Without doubt, many professional practitioners and academic specialists in policy analysis have a keen interest in OTA reports. So how does OTA think of its "audience?" How does this vary with particular projects?

B. The Diversity of Assessment Task-Objectives

The diversity of assessment tasks reflected in current efforts and contemporary policy analysis literature involving the interaction of technology and social system is vast. The Program of Policy Studies (PPS) at GWU emphasized Technology Assessment as its primary theme in its early years. But the latest attempt in 1978 to classify our various studies required a minimum of 16 categories:

- o Technology Assessment
- o Legal-Institutional
- o Energy
- o Transportation
- o Telecommunications
- o Public Health/Biomedical
- o Science and Technology Policy
- o Behavioral
- o Education Policy
- o Innovation Process
- o Research & Development
- o Evaluation/Planning/Design
- o International Science Policy
- o Environmental
- o Urban and Regional Planning
- o Special Studies Areas

This broad scope of studies was the result of several factors including agency needs, stage of development of subject technologies or controls for management of such technologies, and interest of PPS staff members. Clearly, many of these would come within only an extremely broad concept of "technology assessment." Certainly, many of the tasks undertaken were not posed in terms of instrumental rationality, i.e., the evaluation of alternative means to achieve a specified social objective or objectives. Examination of OTA reports indicates that it has experienced a similar explosion of diversified tasks. Hence, it appears difficult if not impossible to characterize such a collection of studies as technology assessments by a single simplistic formulation unless one uses the most general terms.

Perhaps the scope of the diverse studies performed by PPS can be illustrated by references to only one of the above 16 categories, namely Technology Assessment. It will be noted that the nature of the task and the appropriate methodology differ even among the studies in a single catagory. Selected reports from this category include:

- o An Exploratory Technology Assessment of Computer-Assisted Makeup and Imaging Systems (CAMIS)
- o Retrospective Technology Assessment of Submarine Telegraphy: The Atlantic Cable of 1866
- o Technology Assessment in Federal Agencies, 1971-1976
- o An Assessment of Information Systems Required to Support U.S. Materials Policy
- o Revitalization of Small Communities: Transportation Options
- o Implementing Technology Assessments
- o Technology and Public Policy: The Process of Technology Assessment in the Federal Government
- o Technology Assessment Applied to Urban Solid Waste Management Using Baltimore, MD, as a Case Study
- o Social Impacts of Civil Aviation and Implications for R&D Policy

Still, one might appropriately raise the question as to what extent the above studies required or involved a core of interdisciplinary knowledge, unique analytical skills, and a dispositional stance which are common to the performance of studies associated with the rubric of Technology Assessment.

The variety of "policy studies" in science and technology performed by OTA strongly suggests that no particular assessment metholdogy can be uniformly applied. However, this does not necessarily mean that a basic procedural pattern or structure of organizing an assessment effort would not be useful. Certain steps are common to almost all tasks: 1) there must be an agreed formulation of the specific task to be undertaken; 2) the scope of the effort must be established as a framework for identifying the nature and number of the staff, the time required, and the essential information; 3) the overall methodology must be determined and the particular techniques of inquiry to be used with reference to specific needs in implementing the methodological procedure; 4) a schedule of sub-tasks should be constructed with appropriate times for

completion noted; 5) staff members responsible for such sub-tasks should be identified; 6) the staff member to be responsible for integrating the products of the sub-tasks should be assigned; 7) a tentative outline of the final report should be developed; and 8) an advisory panel or other cooperating or reviewing units should be organized as necessary.

The tasks of this particular effort include: 1) expanding upon "TA methodologies" which the reviewers have used or with which they have familiarity; and 2) critiquing selected reports performed by OTA. The outcome of this exercise hopefully will provide some insights to OTA on how it might more adequately manage and perform its function. But the particular purpose appears to be that of gaining the knowledge and thoughts of experienced practitioners outside OTA on the methodological features of OTA assessment efforts. Hence, the thrust of these comments will be on the explication of selected methodological approaches applied by the GWU Program of Policy Studies in some of its studies.

II. The Analytical Mode of Assessment

A. A General Construct

One of the more common TA approaches is designed to respond to assessment tasks which are posed in terms of instrumental rationality, i.e., the evaluation of alternative means to achieve a specified social objective or objectives. Put otherwise, an ends/means formulation of a problem is presented. A General Construct of this methodology might be formulated as follows although there are many variations:

> In the most elementary terms, a methodology or model for performance of comprehensive assessments requires consideration of the following elements and operations: statement of the task-objective presented for assessment which usually entails the assessment of one or more alternative means (configurations) to achieve a given social objective; the constraints placed on the assessing entity; the evolving social environment into which the proposed project or action is to be introduced; the system of participants which will be affected or will in some manner affect the project's progression through the initiation, authorization, implementation, and operational stages; the identification of the effects which will likely flow from these stages; and a social impact evaluation of such effects in accord with a scheme of criteria for determining the viability of the proposed action. This scheme may or may not apply an explicit social justice ordering rationale, i.e., a theory of social value weight and distribution.

This approach, while severely criticized in some quarters, has many strengths. It is a flexible methodology in that it can be applied at various levels of generality/specificity. It can incorporate almost any technique of inquiry useful for the performance of specific assessment subtasks. Hence, it is felt that a mastery of the full methodology would place the TA practitioner in position to perform almost any assessment task in an adequate manner whether posed in instrumental terms or not.

This approach is basically an analytical mode of assessment. It is most applicable to situations in which alternatives are presented -- or to be invented -- for the achievement of specified social objectives. It envisages

some type of benefit/cost or social gain/loss outcome. (See an expanded formulation of the Anticipatory Project Assessment Function in the Appendix to this section.) This approach requires some scheme of evaluative criteria for making a comparison among alternatives. Such criteria -representing social interests or values -- may be assigned by the requesting agency or posited by the assessing entity. If the latter situation prevails, the entity has many sources (authoritative, professional, lessons of experience, etc.) other than its own preferences to draw upon.

The strict analytical mode has increasing applicability to the extent that the following conditions are met:

- o The assessment task-objective is posed in instrumental terms
- o The context is limited or confined
- o Each of the elements or operations of the General Construct are specified, including:
  - The alternatives (project configurations) and the supporting institutional structure
  - The evolving social environment into which the alternatives are to be introduced
  - The affected participants
  - The relevant public/private decision process
  - The effects to be considered
  - The criteria or standards by which the alternatives are to be evaluated as to social impact
- o The effects or consequences of the proposed action or actions are susceptible to quantification or measurement so that an approximate benefit/cost outcome is feasible.

The import of these requisite conditions is that the strict analytical mode is most useful in assessment tasks which are <u>Project Specific</u> and involve a comparative evaluation of alternative means. Most Environmental Impact

Statements pursuant to NEPA involve assessment tasks posed in instrumental form but the above conditions do not normally pertain in a rigorous sense. Both quantitative and qualitative factors are considered and the social benefit/cost outcome is deemed adequate by reviewing courts if a "hard look" is given to the pertinent alternatives and all significant effects are considered to a "reasonable" degree.

B. Adequacy of Performance in Assessment Contexts Dealing With Proposed Actions Posed in Instrumental Form

A substanial segment of the ongoing pre-appraisal activity at the Federal level appears to be in response to anticipation of assessment tasks posed in instrumental form. The requirements of various statutes at the Federal level can be briefly reviewed for the insights which might be afforded to OTA. Both the Council on Environmental Quality and reviewing courts have had a good deal to say about the requirements of NEPA and of other statutes governing anticipatory assessment efforts.

Statutes, regulations, agency policies and guidelines, and judicial review of prescribed requirements and adequacy of performance have dealt with almost every significant component of the General Construct. The most explicit source of relevant methodology and evaluative criteria for pre-appraisal of proposed public actions is found in the current operational procedures of governmental agencies. Statutory schemes such as the National Environmental Policy Act of 1969 (NEPA) require anticipatory assessments of "major Federal actions" and mandate the use of a systematic interdisciplinary approach which must give consideration not only to technical and economic values but also to "unquantified environmental amenities."

NEPA provides a basic statutory framework for policy analysis but is by no means the only authoritative source of evaluative criteria and assessment methodology. The Supreme Court has stated that "NEPA essentially imposes a procedural requirement on agencies, requiring them to engage in an extensive inquiry as to the effect of federal actions on the environment...." Other statutes going to legislative evaluations of particular social goals are said to be substantive in effect. Many assessment contexts will demand that NEPA balancing be performed with reference to the requirements of other Acts. But

the basic point is that the purpose of NEPA "is to insure a fully informed and well-considered decision...."

Regulations of certain agencies and departments are extremely comprehensive in the elaboration of NEPA requirements and cover in detail numerous environmental areas. Particular regulations address "comprehensive resource inventories and monitoring requirements in support of multiobjective planning." The Environmental Quality objective is said to reflect "society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations." These regulations set forth projected periods for analysis; they also suggest that sources for "significant criteria" of evaluation are "Federal and local laws, public opinion, professional judgment, regulations and planning constraints, traditions, customs, etc." "Impact assessment" is said to be "an objective analysis conducted to identify and measure the likely economic, social and environmental effects of each alternative plan." Criteria posited for the evaluation of alternative plans in solving water and land resource problems include: Acceptability; Completeness; Effectiveness; Efficiency; Certainty; Geographic Scope; National Economic Development; and Reversibility. It is pointed out that "public involvement in trade-off analysis is crucial."

The NEPA influence is pervasive. For example, the working groups of the Interagency Review Group on Nuclear Waste Management were directed by the President to formulate a statement of Federal goals and to develop elaborate workplans describing how the government would proceed in achieving the desired goals in this area. The draft IRG Report strongly endorsed the NEPA process as "the controlling element" in the decision process relevant to the design and implementation of a nuclear waste management program. The Energy Reorganization Act of 1974 requires the Department of Energy to prepare and submit

to the Congress an update every two years of the National Energy Plan proposed by the President in 1977. Instructions for development of the Second National Energy Plan directed that the study be conducted in accord with NEPA guidelines.

In general, the policy process is thought of as the analysis of alternative means of achieving specified social objectives. The consideration of alternatives is a primary NEPA requirement. The courts have not only been insistent that alternatives to a proposed action be considered in the NEPA cases but have attempted to provide criteria by which relevant alternatives can be defined. In general, those required to be considered "must be bounded by some notion of feasibility." To establish a viable alternative there must be a showing which is "sufficient to require reasonable minds to inquire further."

The range of effects to be taken into account in assessing the social impacts of alternative courses of action are most comprehensive and detailed in many regulations. But the scope of effects to be considered depends upon additional requirements of the specific assessment context. The geographic range of the effects to be considered will vary with the necessity for programmatic vis a vis site specific impact statements. Further, "In many situations, ... a series of interrelated actions may have cumulative impacts that cannot adequately be analyzed in a series of individual impact statements." And with certain types of proposed actions such as the introduction of a new nuclear fuel cycle which may be employed across the nation, a generic EIS will be required as well as a site specific EIS for any new facilities employing the fuel cycle.

In multi-variable assessment or decision-making some sort of social gain/loss, benefit/cost, or social impact trade-off presentation is normally the appropriate and intended outcome. NEPA requires a systematic benefit/cost assessment, but this term as used in the review of the adequacy of agency performance

in the preparation of impact statements is not necessarily restricted to a highly quantified approach. To do so would simply limit the range of effects or social interests which could be considered. Some assessments, even with respect to NEPA, are relatively simple and a reviewing court may find the EIS adequate if it is demonstrated that the responsible agency has taken a "hard look" at the environmental consequences of the alternatives. The weighing of consequences may also be adequate in some instances even though only approximate evaluations of the social impact of the consequences are made such as "little weight" accorded to the likelihood of a purported social benefit. Or in situations where the advantages of alternative proposals are similar, then an assessment of the options in terms of identifying the least environmentally harmful is apparently adequate.

On the other hand, certain assessments are extremely complex. Estimates of the need for or benefits to be derived from a proposed action may be difficult to measure in any conclusive or precise manner. Such assessments may sometimes lead to the gross adjustment of benefits upward or costs downward in order to justify a project to which a mission agency is strongly committed. But the Supreme Court has emphasized, with respect to the "legal requirements and spirit of NEPA," that the EIS "represent a full and candid assessment of costs and benefits."

CEQ regulations for implementing NEPA requirements supply a primary source of adequacy criteria for current governmental assessment procedures. It is asserted that "Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA." Further, "Environmental impact statements shall be concise, clear, and to the point, and shall be supported by evidence that agencies have made the necessary environmental analyses." In elaboration it is mandated that "plain language" and "clear

format" be employed so as to enhance the usefulness of the EIS "to decision-makers and the public." The most significant environmental issues are to be identified and emphasized. Environmental impact statements (EIS) "shall provide full and fair discussion of significant environmental impacts and shall inform decisionmakers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." The range of alternatives to be discussed in the EIS "shall encompass those to be considered by the ultimate agency decisionmaker." The regulations require that agencies "insure the professional integrity, including scientific integrity, of the discussions and analyses," that methodologies used be identified, and that "explicit reference" be made to sources relied upon for "conclusions in the statement."

These indicators of adequacy of performance outcome supplied by authoritative sources are useful as measures of option clarification. Alternative thinking constitutes the "heart of the environmental impact statement." The primary emphasis is on option clarification since the responsible agency is directed to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." Surely, any purportedly independent assessing entity should expect to have its performance judged by criteria relevant to option clarification. At a minimum, such entity would wish to present: 1) an understandable report, 2) an assessment which provides a basis for comparing the social advantages and disadvantages of the relevant alternatives by reference to explicit criteria of evaluation, and 3) an outcome otherwise supported by recognized analytical techniques which have been applied in a professionally competent manner. Deeper inquiry will disclose, however, that the concept of clarification is not simple. For example, toward which

participants in the assessment context is the clarification to be primarily directed? To what extent might this inquiry be answered by the task objective specified? Should clarification emphasize immediate, short-term or long-term impacts of the proposed intervention? How might the evaluative criteria selected for application affect the degree of useful clarification? What basic assumptions about existing societal organization, effective decision processes, evolving value orientations, and essential conditions for long-term societal adaptability influence the responses to those questions?

Numerous conditions and concerns enter into the deliberate task of developing a concept of clarification which is operationally useful. Several points merit brief consideration. Whatever primary criteria of adequacy are selected will need to be tailored to the specific assessment context of particular efforts. The models posited of the evolving social environment, decision processes, and the system of affected participants will shape the notions of clarification in given instances. But, various difficulties may arise due to factors which the assessing entity is not in position to control -- at least not fully. For example, how is the concept of clarification to be dealt with under conditions of severe constraints on total resources provided, or on time for performance, or on the availability of essential information sources? It is not hard to imagine the difficulties confronted in maintaining a consistent concept of clarification in situations where various segments of a complicated assessment task are distributed among several different entities.

The users of an assessment outcome will likely have an interest not only in an estimate of the ultimate gains and losses resulting from a proposed action, but will want to know the social implications at each phase of the authorization, implementation and operational process, including the distributional effects. Further, any responsible user of the assessment outcome will have an

interest in the comprehensiveness and selectivity of the analysis. The relevant decisional entity will obviously hope to have an assessment presentation which enhances its capability to make a rational and defensible choice among feasible alternatives.

APPENDIX TO PART II

APPENDIX TO PART II

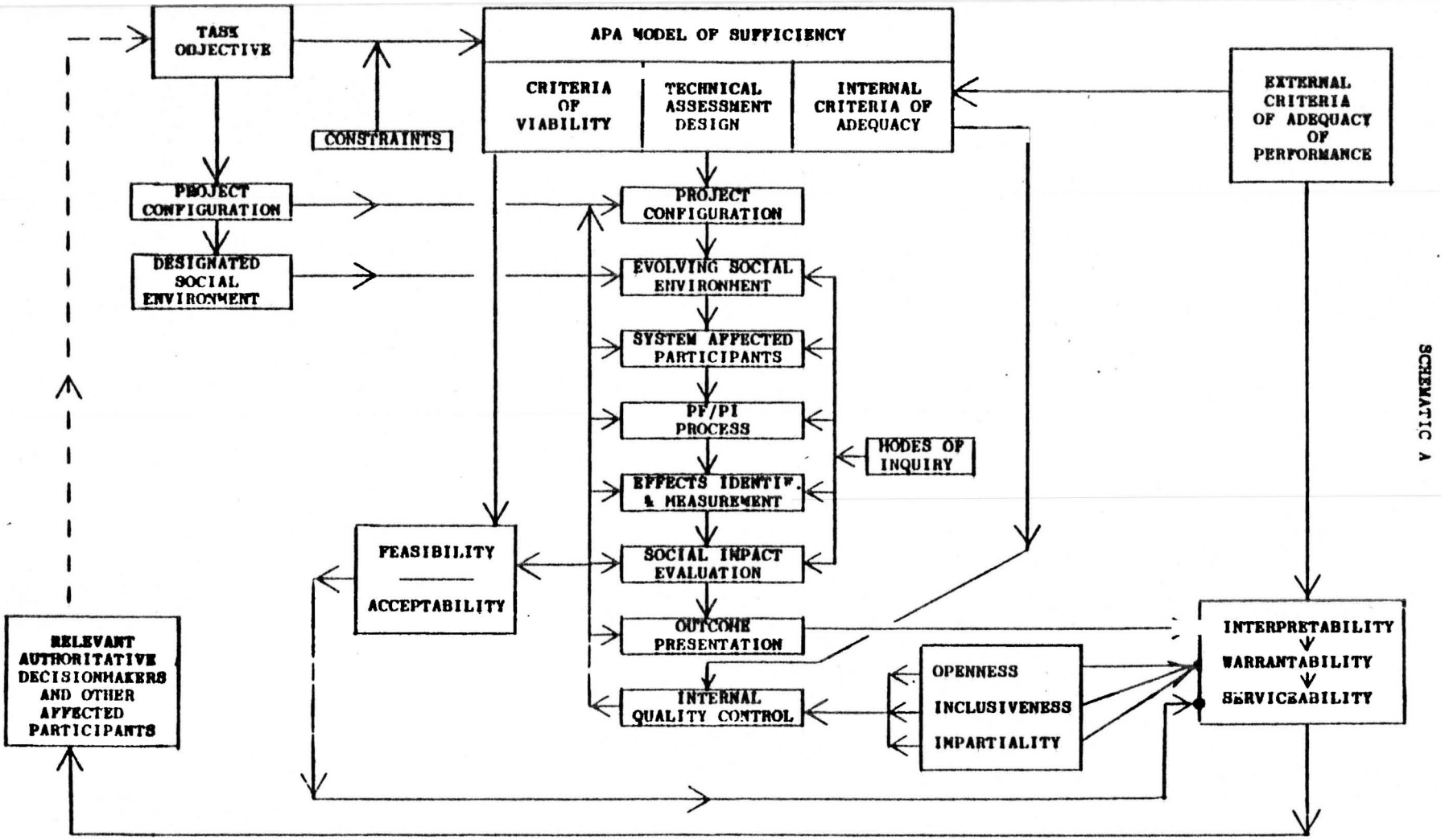
Anticipatory Project Assessment Function (APA)

Mayo, Louis H. "Monitoring the Direction and Rate of Social Change Through the Anticipatory Assessment Function: Some Implications for Professional Education." Monograph No. 29. Washington, D.C.: The George Washington University, Program of Policy Studies in Science and Technology, July 1977.

The APA Construct merely suggests the extensive conceptual, informational, and analytical demands for the construction of a suitable model for adequate anticipatory assessment performance. Much thoughtful study has been given to policy analysis models.[64] The record of performance pursuant to such models is another matter, however, and will be dismissed here with the brief observation that organizational, interpersonal, time, informational, and funding constraints pose serious obstacles.

Our present concern is with the conceptual notions and analytical tasks associated with an APA Model of Sufficiency. The basic components of this model are shown in Schematic A.

APA MODEL



SCHEMATIC A

Limited elaboration will be given the following components for purposes of explaining the rationale of the model: 1) Concept of Technical Assessment Design; 2) Notion of Project Configuration; and 3) Criteria of Viability for evaluating a proposed public action.

1. The Concept of Technical Assessment Design

The Technical Assessment Design and its associated modes of inquiry should be formulated so as to provide a satisfactory procedure for assessing the effects of a proposed action against a scheme of viability criteria and the results of this task against the criteria of adequacy of performance.

Policy analysis models for designing a satisfactory technical study plan are numerous.[65] Formulations differ depending upon the purpose, postulates, and particular methodological nomenclature of the analyst. However, in one way or another a comprehensive anticipatory assessment process must consider the assigned or posited task-objective; the project configuration; the evolving social environment into which the proposed project or action is to be introduced; the system of participants which will be affected or will in some manner affect the project's progression through the initiation, authorization, implementation, and operational phases; the identification of the effects which will flow from such action; and an evaluation of such effects in accord with a scheme of criteria for determining the viability of the proposed action. Numerous variations in

approach, including the application of reductionist techniques, will characterize the technical assessment design for each particular task-objective.[66] It is generally recognized that there is no single mode of approaching the anticipatory assessment task.[67] All useful conceptual and analytical aids to "structured thought"[68] are likely to be employed insofar as they are available to the assessing entity.

Assuming a basic technological means is to be employed, the technical assessment design can be represented as follows:

1) A specified Project Configuration (technological system with implementing and operational apparatus) is to be introduced into:

2) The Relevant Evolving Social Environment[69] defined as the full social context anticipated to interact with the project configuration and including:

- time period projected
- relevant geographical area
- jurisdictional dimensions - authoritative (formal) and private sector
- relevant conditioning factors and trends which might be organized in terms of social value-institutional processes (public decision process; process of technological innovation; economic resource allocation; knowledge and skill capabilities; urban and regional developmental processes; societal behavioral patterns; processes of exercising options pertaining to individual well-being; processes affecting the quality of the natural environment, etc.)

A critical component of the evolving social environment is:

3) The System of Assessment/Implementation Participants which deals explicitly and systematically with all

those public and private sector entities, public officials, and private organizations and individuals likely affecting or affected by the assessment/ implementation procedures. Such participants, having differing perspectives, claims and resources, will develop strategies, based upon their resources and influential social conditions and trends, to be applied in relevant public/private decisional arenas to achieve outcomes which will satisfy their claims.[70] Such claims will be asserted in:

4) The Policy Formulation and Program Implementation (PF/PI) Process[71] which includes the phases of:

- Perception of the "problem" or "task" or "action" proposed
- Formulation of the "problem context" and problem definition
- Assembly of relevant information
- Invention of alternative means or courses of action
- Assessment/Recommendation of the selected course of action (Project Configuration)
- Formal prescription of law or authorization of new program based on the selected course of action
- Application of new statutory scheme in appropriate decisional contexts and/or implementation of the prescribed program
- Appraisal of the Effects of the application of the statutory scheme or of the operation of the program
- Modification of the statutory scheme or of the program based upon continuing monitoring and appraisal.

> The PF/PI Process provides for the clear identification of the loci of the numerous interactions (decision points) which will likely occur involving the System of Participants in the assessment, authorization, implementation, and operation of the proposed project/program, i.e., successive phases of the assessment effort. Each phase of the PF/PI Process will involve a somewhat different set of interactions, decisions, follow-on actions, and effects.

This procedure has the advantage of assisting in the specification of the Specific (Relevant) Assessment Context which varies with the project configuration, the evolving social environment, the system of participants, the relevant authorizing and implementing public/private decisional entities, and the phases of the PF/PI Process. In brief, the specific assessment context represents the "zone of interactions" anticipated to occur at the intersection of the system of participants with the public/private decisional entities at each phase of the PF/PI Process. From each of these interactions, decisions, or follow-on actions, effects will result. The specific assessment context device is a means by which effects can be comprehensively, explicitly, and systematically identified. Explicitness as to the relevant assessment context contributes to the specificity with which effects can be measured for probability and magnitude and evaluated for degree of social desirability or undesirability.

2. The Notion of Project Configuration

Project Configuration refers to the means by which a specified social objective is to be achieved or a need is to be satisfied. A fully formulated project configuration would specify not only the technological component to be employed but should be inclusive of the total implementing resources necessary to place the instrumentality into operation.[72] Often task objectives for anticipatory assessment do not supply a full formulation. There may be a variety of reasons for incomplete specification. In many instances the analysis, research, development, demonstration and planning have not progressed to the point essential for the final matching of the technological means with particular social objectives.

If a project configuration having a basic technological component is to be employed to achieve a given objective (the satisfaction of specified transportation, housing, or energy needs), the inclusive configuration would include such elements as the following:

> The precise technological component to be employed, its readiness or future availability (including all auxiliary units).
>
> The institutional-processes through which the proposed process must move for purposes of authorization, funding, implementation, operations, etc.
>
> The formal authority (legal prescriptions, statutory schemes) required for implementation and operations, and the authoritative decisional entities involved in the ongoing prescribing, invoking, applying and appraisal functions.

- The financing/funding arrangements and the other resource requirements such as informational needs, professional skills, etc., for implementation and operations, including proposed allocations of responsibilities and distribution of attendant costs.

- The management/administrative arrangements which must be provided in both the public and private sectors for implementation, operation, and continuing appraisal.

- The scheduling of the stages of authorization, implementation, and operations.

- An estimate of the costs of the planned configuration elements including "hardware," costs of the efforts required in personnel, time, professional skills, and other requisite resources throughout the authorizing, implementing, and operational stages. (Costs of condemnation of properties, relocation of residents and businesses, and the provision for new facilities and services incident to such relocation may constitute a major cost item in many projects.)

- Enumeration of the legal (or other) requirements, constraints, and limiting conditions imposed upon the project design such as public health and welfare standards, safety factor specifications, cost limitations, time for completion constraints, etc.

Unless a well-structured project configuration and a precisely projected social environment are specified, the analytical operations of effect identification and measurement and social impact evaluation of such effects cannot be confidently performed.[73] With precise specification, it can be determined with greater accuracy whether the specified alignment of technology, formal authority, institutional structure, financial arrangements, administrative/management organization, the scheduling of events, and the attendant social costs present a viable means of gaining the social objective sought.[74]

3. Criteria of Viability

Schemes of criteria applied, proposed or illustrated for the purpose of evaluating proposed public actions are seemingly unlimited in scope and variety. The Preamble to the Constitution provides a useful collection though these are of a general nature.[75]

Authoritative Constitutional/legal prescriptions are clearly significant directives for the formulation of criteria of viability but this task is by no means confined to the legal profession. All recognized professions have standards by which relevant subject matter, methodology and performance are measured. Social acceptability deriving from experience and custom may also provide certain requirements and constraints on the viability of proposed public actions.

Numerous familiar criteria exist for evaluating the desirability of proposed public or joint public/private programs and projects.[76] Such standards as the "public interest," "general welfare," and "public health and welfare,"[77] are commonly employed as the basic standard for public actions. Economists speak of both productivity and equity or sometimes of efficiency and equality.[78] Certain criteria refer to social needs such as survival, security, and self-realization,[79] others to legal validity[80] and social justice.[81] The maintenance of reasonable expectations[82] is one of the major concerns of the authoritative process of decision as is the stress between the imposition of accountability on the one hand and the need for discretion and autonomy on the other.

Clearly, viability refers not solely to formal authority (legality or Constitutionally) but to such notions as technical practicality, workability, effectiveness, economic efficiency, political feasibility, social acceptability, and "equitable" distribution of benefits and costs.[83] In ordinary language viability refers to the ability to live and grow. In "social systems" language the desired characteristics of a proposed project configuration would likely be described in terms of stability, adaptability, and capacity for self-regulation in the social context into which it is to be introduced.[84] The concepts and related criteria for evaluating proposed project configurations for their "eco-systemic" viability[85] are of a far more complex order than the simplistic, formalistic test of "logical consistency."

Yet the formal authority supporting a proposed action is an essential if not the sole consideration in the evaluation of viability. Further, many statutory schemes and implementing regulations authorizing public programs refer to technological, economic, institutional, and social criteria.[86] These may be stated in terms of objectives, constraints, or requisite conditions. They may have the effect of assigning relative weights to the social values involved in the decisional context which will to some degree limit the alternative project configurations available for consideration to achieve the specified social purpose.[87] Clearly, an integrated approach involving the concepts, knowledge base and analytical techniques of a variety of

disciplines and professions will normally be required for the satisfactory evaluation of proposed public projects.

Some of the more general approaches to the evaluation of proposed public actions include: systems concepts which place emphasis on "dynamic stability" meaning not merely survival but adaptability to changing conditions;[88] various approaches to social benefit/cost and benefit/risk analysis which range from impressionistic to deliberative judgmental to rigorous calculative methods;[89] "operational ethics" concepts which involve a continuing reconsideration of the interaction between means/resources and goal values;[90] and policy-oriented jurisprudential frameworks directed toward the realization of "human dignity."[91] Social value and social interest schemes sometimes represented by explicit criteria, afford means of determining approximate social benefit/cost ratios of proposed actions.[92]

Operational Criteria of Viability will likely differ somewhat with each proposed project even though certain criteria tend to be relevant, in varying degree, to all actions. Further, criteria of viability may serve distinguishable functions in the evaluation process. Some express limiting parameters going to feasibility. For example, if a proposed project is simply not technically practicable or clearly unworkable or ineffective, there is little need to go further with the evaluation. Lack of Constitutional or legal authority, excessive cost, social unacceptability, or political infeasibility during a particular period of time may be effectual limiting constraints on a

proposed project. Yet, even these types of criteria should not be taken as absolutes. What might be considered to be excessive or unreasonable cost will vary with the need or benefit anticipated from the implementation of the project.[93]

Assuming that the proposed configuration appears in the initial estimate to fall within bounds of the limiting parameters of feasibility, then the object becomes one of assessing its likely benefit/cost ratio so as to compare alternative proposals designed to achieve the same or similar social objective. Criteria of acceptability[94] should be designed to determine relative degrees of desirability among alternative projects and should relate to all substantial elements of the configuration and to all value-institutional categories which will be substantially affected during the phases of project progression.[95]

With reference to the notion of project configuration it should be noted that each element of the configuration must not only meet the appropriate test of viability standing alone, but must constitute a functionally integrated "system" which will meet the fundamental viability criterion of project alignment workability.[96] Clearly, the configuration will not function if there exists--and likely continue to exist--certain deficiencies with respect to particular elements: technological impracticability, failure to comply with basic Constitutional requirements, lack of sufficient funding, or inordinate risks (to health or safety) as compared to prospective benefits. Each element must not only be practicable, reasonable or acceptable from the

standpoint of feasibility but the full configuration, as noted must constitute a workable system in the relevant evolving social context.

Illustrative Evaluative Framework #1

BASIC FRAMEWORK OF VIABILITY CRITERIA

- Perceived/Provisional Estimate of Social Need/Benefit

- **Feasibility:**
  - Technical Practicability
  - Economic Reasonableness
  - Constitutionality/Legality
  - Political Feasibility
  - Social Acceptability

  Project Alignment Workability

- **Acceptability:**
  - Power - Constitutive Process
  - Wealth

  Optimality:
  - Enlightenment
  - Skills
  - Respect
  - Affection
  - Well-Being
  - Rectitude

  Social Gain/ Loss Estimate of Alternative Project Configurations

  * Concept of Distributive Justice?

- **Alternative Social Systems Criteria**
  - Survivability
  - Stability
  - Adaptability
  - Evolving Levels of Social Acceptability
  - Ethic of Cooperation and Interdependence
  - Reversibility

PROVISIONAL SOCIAL VALUE SCHEME

Suggestive of the types of Effects which will flow from any project configuration introduced into a future social environment, including individual, organizational, and social behavioral patterns

- Social Impact Identification involves:
  1) Identification of Effects (consequences)
     a) Planned (outputs):
        Direct, Immediate, or Long-term
     b) Derivative (2nd, 3rd, etc., - order) consequences
        - Side effects - immediate
        - Indirect - remote
          - Probable
          - Improbable
  2) Effects associated with:
     - Implementation Stage
     - Operational Stage
  3) Effects related to:
     - Participants
     - Institutions
     - Processes
     - Values
  4) Effects evaluated in terms of:
     - Probability
     - Magnitude or intensity
     - Persistence
     - Social desirability
       - Positive or Negative
       - High-Moderate-Marginal-Equivocal

POWER (Effective Public Decision Process)

Reasonable access to community forums: governmental, private, etc., for expression of opinions on matters of public concern
Broad participation in public decision-making (consistent with adequate and timely decisions)
- Problem Formulation
- Policy Analysis
- Project Planning
- Program Implementation

Effective multi-participant decision-making
- Intergovernmental coordination
- Federal-State-Local-Regional
- Government-Industry
- Multi-national

Decision flexibility - keeping options open
Improved capacity to maintain international stability
Improved capacity to deal with questions of national defense and security

WEALTH (Resource Development and Distribution)

Strengthened national base and R&D capability
Stimulation to technological innovation
Stimulation to private, competitive enterprise
Economic development of depressed areas
Upgrading level of skilled manpower
More rational natural resource development; multi-national resource development
Increased business and industrial opportunities
New markets and investment opportunities

ENLIGHTENMENT (Creation and Dissemination of Knowledge and Skills; Ability for the Performance of Particularized Tasks or Functions)

Strengthening of basic research: Government, Industry, Universities, Other
More adequate information/analysis base for public policy decision-making
Rational allocation of resources to national goals
Improved capability in the management of complex social systems, including:
- Technological Forecasting
- Policy Analysis
- Project Planning Modelling
- Simulation
- Program Implementation
- Monitoring and Evaluation

Improved safety applications and techniques
Improved vocational/career training techniques

SOCIAL BEHAVIORAL PATTERNS

Clarification and exposition of norms of responsible conduct as related to all public and private participants involved: Operators
Adequate discharge of statutory responsibilities (accountability to the public)
Improved levels of administrative & managerial performance
Increased disposition to view full social implications of a technological application
Increased disposition and capability of government, industry, universities, and other institutions to apply joint resources to national needs
Contribution to responsible public behavior by means of dissemination of new knowledge and transfer of capability to other social function areas
Increased international understanding through joint efforts and mutually responsible behavior

ENVIRONMENTAL QUALITY: SOCIAL AND NATURAL

Social cohesiveness: Congenial family environment
Congenial neighborhood environment
Non-discriminatory access to all "public" social and cultural institutions and activities
Meritorious contributions recognized without discrimination
Recognition of opportunity for individual development of interests and talents
Equality of treatment in formal proceedings and social activities
Recognition of a high level of individual autonomy and right of privacy
Assurance of minimum standards of living conditions Compatible with sense of Human Dignity
Access to essential goods and services without discrimination (consumer benefits and diversity of choice)
Adequate consumer protection
Adequate facilities and pursuits for leisure & recreation
Availability of/and diversity of job opportunities
Adequate medical and psychiatric services
Adequate public safety - police protection
Adequate fire protection
Adequate insurance protection
Adequate sanitation services
Adequate housing
Availability of utilities
Optimum natural environment: Water; Air; Landscape, Wildlife
Avoidance of harmful effects on environment
- Minimum artificial hazards
- Minimum offensive noise
- Minimum esthetic debasement
- Minimum radiation emissions
- Minimum congestion and crowding

As noted, the evaluative task can be facilitated by a classification of criteria into those relating to feasibility and those relating to optimality. Depending upon the situation, the same concern may relate to either of these categories. Feasibility criteria express limiting parameters such as technical impracticality, excessive economic costs, lack of Constitutional or legal authority, political infeasibility, or decisive social unacceptability. Such criteria assist in determining if a proposed action is simply impracticable, unworkable, ineffective, or otherwise unacceptable. For example, in the NASAP study a fuel cycle which did not promise to reduce nuclear proliferation was simply unacceptable. However, such criteria must be considered with reference to social need (energy) and to other variables during given periods. They should not be taken as absolutes. What might be considered unreasonable cost will vary with the need or benefits anticipated from the implementation of a given action.

Assuming that the proposed project or action appears in the initial estimate to fall within bounds of the limiting feasibility parameters, then the object becomes one of assessing its likely social gain/loss ratio so as to compare alternative configurations designed to achieve the same or similar social objective. Such criteria of Optimality or Acceptability should be designed to determine relative degrees of desirability among alternative configurations. Hence, a basic framework of viability criteria might be constructed (with any degree of elaboration desired) along the following lines:

- o Feasibility Criteria - Must meet tests of
  - . Technical Practicability
  - . Commercial Viability
  - . Legality
  - . Political Feasibility
  - . Social Acceptability
- o Optimality Criteria - Degree to which
  - . Strengthens Structure of Authoritative and Controlling Decision
  - . Promotes Economic Competition, Resource Development and Conservation
  - . Promotes Technical Knowledge and Skills
  - . Promotes Social and Associational Cohesion
  - . Provides for Equitable Distribution of Benefits and Costs
  - . Promotes the Establishment and Maintenance of Norms of Responsible Social Conduct
  - . Promotes Well-Being in Terms of Protection from Harm and Access to Needed and Desirable Goods and Services
    - x Safety of Person and Property (Numerous Dimensions)
    - x Assured, Dependable and Reasonable Cost Energy Supply
    - x Minimum Disruptive Impact on Community Institutions and Services
    - x Assured Reimbursement for Harm Flowing from Unavoidable Risks

III. The Concern Approach to Anticipatory Assessment

A. Features of the Concern Approach

Clearly, the technical assessment design must be tailored to the task-objective posed and the specific assessment context. Even tasks posed in a basically instrumental form may require different methodologies. The Concern Approach to anticipatory assessment offers another way to think about a given task and suggests alternative means of constructing the technical assessment design.

The concern approach has several features and implications which can be briefly noted. This mode of analysis starts with the empirical claims, demands, and concerns about societal risks in the broadest sense. This basic reference of evaluation is in contrast to the assigned or constructed scheme of criteria which serves as the evaluative standard in the strict analytical mode. These empirical concerns are associated with three primary assessment outcome user groups: responsible decision makers; others affecting the proposed action or likely to be affected by it; and future generations, i.e, the long term viability of society. The final set of concerns is composed of those expressed in the context of the specific project or action proposed. Concerns are of many types. Some are project specific; others are much broader in scope and may refer to public attitudes about national goals, advancing technology, the competence and integrity of the structure of authoritative decision, or to institutional development.

Concerns reflect public perceptions about societal risks. Hence, from an analytical standpoint they carry connotations of probability, magnitude and social desirability or undesirability -- whether expressed thoughtfully or emotionally, whether personal or manipulative in origin. Futher, concerns provide an indispensable -- if not ultimate -- standard by which public acceptability of proposed actions can be judged.

Various claims can be made for the concern approach vis a vis the strict analytical mode. The survey and ordering of concerns expressed or sensed with respect to a given proposal compels consideration of the broadest scope of potential social impacts. Since these will include qualitative as well as highly uncertain effects, the concern approach is inclusive of effects the analytical mode may frequently ignore.

But a more significant feature of the concern approach is that it provides a sensible and understandable construct of the relationship of criteria of Adequacy of assessment performance to the Stance of the independent, general interest assessing entity and thus to the appropriate Methodology to be applied in specific situations.

B. Criteria of Adequacy of Performance

The efficacy of alternative constructs of assessment depends upon the concept of mission for this function. The independent assessing entity can hardly stop with the general notion of the clarification of options for the intended users of the outcome. Something more is necessary if clarification is to be given operational substance. Both the technical assessment design and the perspective of the entity applying this methodology are clearly related to some notion, explicit or implicit, of adequacy, i.e., criteria for satisfactory assessment performance.

Numerous concepts, standards and criteria of adequacy have been prescribed in regulations, judicially developed, advanced in the scholarly literature, and derived from actual experience which are clearly relevant considerations for evaluating assessment outcomes. These range from particularized requirements to the comprehensive formulation of Lasswell's Intelligence and Appraisal Function. Nevertheless, an alternative formulation of adequacy is here offered as an operationally focused guide for assessment performance and outcome evaluation.

Three primary criteria are posited as the core elements in this alternative construct of adequacy: Interpretability, Warrantability, and Serviceability. These criteria can be described as follows:

Interpretability: This criterion requires that the assessment outcome be presented in understandable form to those who will be expected to act on the outcome or who in some manner will be affected by any further actions relevant to the proposed action. The outcome presentation should, as precisely and succinctly as practicable, state what the proposed action is, the social objectives to be achieved, the feasibility of the action, and an appropriate representation of the likely social impacts anticipated.

Warrantability: This criterion is concerned with authenticity and sufficiency of the methodology and the professional competency with which the assessment is performed. Warrantability goes to such subordinate criteria as dependability, completeness, and creativity. It goes to the deliberateness of the selection of appropriate modes of inquiry and relevant guarantors. It goes especially to underlying methodological assumptions, to the characteristic of openness of methodology including display of the complete model of assessment, the data sources used, the basis upon which criteria of evaluation are selected and applied, the reductionist techniques employed, and the specification of remaining areas of uncertainty. This criterion also encompasses the degree to which internal coherence has been established among the elements and operations of the assessment model. It further includes the obligation to maintain coherence in the assessment performance as well as in the design of the assessment model.

Serviceability: This criterion goes to the utility of the outcome for decision makers responsible for taking or not taking or modifying the proposed action and to its usefulness to those who will otherwise affect or in some manner be affected by accepting or not accepting, or by accepting an approved modification of the proposed action. Serviceability is to some extent dependent upon the two prior criteria of interpretability and warrantability. Serviceability requires selectivity in that the assessment outcome should be directly related to the problem perceived by target users. Criteria demands of serviceability include feasibility as well as the specification of likely social gains and losses (and their distribution) anticipated to result from the alternative configurations assessed. Succinctly, serviceability undertakes to measure the extent to which the assessment outcome provides perspective on the problem facing the decision maker and other affected participants.

The concern approach is a logical extension of employing the serviceability criterion of adequacy. Assessment of the concerns of each of the primary user groups becomes the basic function of the independent assessing entity. We assume that the concerns assessed from each of these observation standpoints are of general interest importance. Thus, it might be objected that there is no real distinction among the user groups as to priority of concerns. However, while correct that the primary concern structures are overlapping, it is also correct that different degrees of emphasis will be given to particular concerns by each user group. For example, a sponsoring agency for an assessment by an independent entity will surely attempt to formulate a task-objective which is relevant to the problem it wishes illuminated and upon which it presumably can act. But it will also be vitally interested in such outcome items as: 1) the extent to which the assessment outcome demonstrates the degree of workable alignment between formal authority, agency responsibility, agency mission commitment, resource availability, and socio-political acceptability; 2) the degree to which distinctions among project options in terms of social advantages and disadvantages are clearly explicated with reference to explicit evaluative criteria and supported by warrantable methodologies; 3) the degree to which the outcome facilitates necessary or discretionary follow-on decisions or other actions; and 4) the areas of remaining uncertainty and risks associated with each project configuration (alternative). While others affected by the proposed action do have an interest in such matters, the foregoing items will likely be more crucial to the responsible decisional entity.

The basic rationale of the Concern Approach may thus be summarized as follows. The objective of anticipatory assessment is to clarify policy or project options. Option clarification is defined by criteria of adequacy of

assessment performance, i.e., interpretability, warrantability, and serviceability. The perspective of the independent assessing entity is that stance which will produce the highest practicable level of serviceability to the three primary user groups, i.e., relevant decision makers, others affected by the proposed action and future generations. Serviceability is defined as the explication of the more significant general interest concerns attached to each of the user groups. Clarification is achieved to the extent that such concerns are illuminated. The assessing entity then has the objective--and obligation--to demonstrate how concerns relevant to any given action will be alleviated or exacerbated by the alternatives proposed and how this information can be converted into measures, tests, or criteria of operational usefulness to decision makers.

Hence, it can be seen that the concept of adequate assessment performance posited (serviceability) defines the perspective of the independent assessing entity (purposive stance) and that this stance then requires a methodology (including technical assessment design, techniques of inquiry, and quality control conditions) which will best explicate relevant concerns for purposes of comparing policy to project options. Formulating pertinent questions in the specific assessment context to identify the concerns with respect to each of the three primary user groups is critical if the adequacy criterion of serviceability is to be met. The final list of concerns for a particular assessment task will reflect the concerns of all three primary user groups although the degree of interest of each group may vary with particular concerns. This final list should be organized in such manner as to facilitate the explication, and hence the serviceability, of each of the concerns. Clearly, this is an opportunity for creativity on the part of the assessing entity since considerable discretion will be present.

The concern approach is directly related to the claims and demands expressed in the public decision process by primary user groups. The fact that an assessing entity usually must exercise discretion and judgment with respect to numerous facets of the design and performance of specific assessments is the basis for characterizing perspective as purposive stance. The degree of volition will vary among assessment situations, but to the extent that discretion exists, the assessing entity has a corresponding scope of control over the production of a serviceable outcome. Certain constraints exist in almost every assessment context--time, information access, staff capabilities, financial resources, etc. Further, the task objective may to some degree specify the supposedly relevant social environment or the effects to be identified and the techniques of inquiry to be employed or even the manner of presentation of outcome. Thus, the discretion of the assessing entity may in varying degree be circumscribed in its performance and choice of outcome presentations. The stance of the entity may be relatively inflexible if all components of the technical assessment design are explicitly specified. In the latter situation the strict analytical mode of assessment may be the preferred approach.

C. Explication of Concerns by Estimating the Potential Difficulty of Norm Resolution

The explication of concerns for the three primary user groups can be performed in several ways. Selection of the appropriate model depends upon the task objective and the specific assessment context. The 1st Model involves an integration of the concern approach with the analytical mode. Current operational procedures pursuant to NEPA and other statutes reflect this approach to a degree. While a scheme of evaluative criteria may be prescribed, agency regulations also provide for public comments and hearings on particular projects which produce knowledge of immediate public concerns about such projects. However, a much more systematic approach to integration is quite practicable.

The 2nd Model utilizing the concern approach involves viewing all concerns as risks. There is a risk in doing something and there is a risk in not doing something. In the 2nd Model concerns are used as standards of evaluation in somewhat similar fashion to the manner in which a scheme of evaluative criteria is used in the analytical mode. For example: 1) in a given context concerns exist with reference to the status quo situation in the relevant social problem area; 2) alternative configurations are proposed to gain a certain social objective in this problem area; 3) each alternative configuration is then assessed to determine whether each of the major concerns identified will be alleviated or exacerbated by such action; and 4) the alternatives are then compared with reference to the number and importance of the concerns alleviated or exacerbated by each. This procedure provides one type of social gain/loss outcome.

The 3rd Model supplies a unique technical assessment design for a special class of task-objectives. This model may prove useful in situations where decisions must be made on proposals having long term effects -- some of which

may be highly uncertain but potentially catastrophic in their consequences. Here the public perceptions of the risks differ radically, and heated controversy exists and in all probability will continue because long range institutional values are at stake. In these circumstances it is often difficult if not impossible to determine with any accuracy whether the concerns about the risks will be alleviated on the one hand or exacerbated on the other by the action proposed. Hence, no simple trade-off between alleviations and exacerbations can be made.

It thus becomes helpful to start with the notion of Public Acceptability of the risks involved. But how does the assessing entity (or the final decision maker) make this assessment? Survey and sampling have their uses but they often do not really test potentially affected parties in an arena where the actual stakes are at issue, i.e., in an arena where rights and duties and actual benefits and costs are decided. Hence, it is felt more appropriate per the 3rd Model to design a new test of Public Acceptability which is operational in a highly realistic sense. This test involves asking: Can the Norm (or norm structure represented by any given project configuration) be authoritatively established and maintained? But how is this outcome to be determined? How is it applied in a 3rd Model type of assessment? An extremely brief description of this relatively complex methodology is outlined below by means of an illustrative case.

Any major technologically-based program or project has an identifiable set of activities associated with it. These activities embody various types of risks affecting health, safety, individual liberties, social cohesion, community standards, economic well-being, etc. Hence, issues arise from these activities generating ongoing controversies. Such issues can be organized into concern categories which generalize common aspects of these issues. Concerns

thus express perceived risks and in varying degree the severity of these risks and the ability (or lack of ability) to control the risks. The aggregate of concerns relevant to a proposed action constitute the overall problem. The concern approach focuses both on the concern categories and the particular issues comprising the concerns, i.e., issues of concern. The central inquiry goes to the examination of the manner in which a proposed action (or each of the alternative configurations being assessed) will affect the issues of concern.

For purposes of developing briefly an outcome estimating the potential difficulty of norm resolution, an Illustrative Case comparing nuclear power system alternatives to the present light water reaction (LWR) system can be used. (The George Washington University. Program of Policy Studies in Science and Technology. Public Concerns and Alternative Nuclear Power Systems. February, 1980.)

First, the many issues of concern relating to the nuclear power context (U.S. LWR system) are identified by recourse to the literature, to current press stories, and to expert opinion. These issues are then organized into major concern categories encompassing all of the issues identified. Concerns will range from the relatively simple technical and operational categories of risks to those involving complex institutional processes at both the national and international levels. (See next page) The next step requires that each of the concern categories be assessed for Significance, i.e., difficulty of norm resolution. The degree of significance of a concern will attach to any norm of the configuration being assessed which is associated with an issue of concern within that concern category.

The determination of concern significance might be made in various ways, as for example: 1) by the use of a scheme of criteria pertaining to public attitudes about risks associated with the concern and about the competence

TABLE I

THE THIRTEEN CONCERNS

A. POSSIBLE PROBLEMS WITH OPERATIONS:

Catastrophic accident (CAT)
Radiological and chemical health hazards (RCH)
Low level radiation (LLR)
Environmental pollution (ENV)

B. IMPROPER USES OF FACILITIES OR MATERIALS:

Materials diversion (domestic) (MAT)
Foreign safeguards (FSG)
Sabotage (SAB)

C. DECISION PROCESS SURROUNDING NUCLEAR POWER:

Integrity and competence of institutions (I&C)
Relative costs of nuclear power (RCN)
Distribution of costs, benefits, and risks (present) (DCB)
Individual rights (IRT)

D. LONG RANGE EFFECTS OF DECISIONS ON NUCLEAR POWER:

Economic viability and international position (EVI)
Future generations (FUT)

and integrity of the structure of authoritative and controlling decision relating to nuclear power to resolve controversies involving such risks; 2) by the use of a framework of reliability criteria directed primarily toward the capability of the nuclear power decision process (hereinafter referred to as the decision process) to resolve the risks; and 3) by subjecting norms associated with the issues of concern to a thorough contextual assessment.

Following the first technique suggested above for assessing significance, the entity can employ a set of criteria or Dimensions such as: 1) The scope and intensity of value conflict aroused by a given concern; 2) The extent of disagreement among experts on the risks reflected by the concern; 3) The extent of disagreement among experts on the means for controlling such risks; 4) The extent to which such risks are associated uniquely with nuclear power; 5) The priority of concerns in terms of affecting other concerns; 6) The tendency of the concern to change with sudden events; 7) The tendency of the concern to change as a result of gradual trends; and 8) The degree to which acceptable authoritative procedures are available for establishing and maintaining norms associated with risks reflected by the concern. Various techniques might be utilized in applying these criteria to the determination of the significance of the concern, i.e., the potential difficulty of resolving specific issues encompassed within each concern category.

The most significant concerns are likely to be those having broad institutional implications such as foreign safeguards or future societal viability. There will probably be considerable disagreement on the nature of the risks and the controllability of the risks. For example, controlling risks will be subject to many contextual factors, many of which will not be within the control of the U.S. nuclear power decision process or of any other authoritative entity. Hence, norms associated with such concerns will prove extremely

difficult to resolve. The least significant concerns will likely be those which refer to familiar risks that have been dealt with by the existing decision process. Environmental pollution, the relative costs of nuclear power and the distribution of benefits and costs (as in the case of siting facilities) are concerns likely to come within this general category. The existing decisional structure now provides norms for the control of the issues of risks relevant to these concerns or appropriate authoritative decisional arenas exist for the resolution of appropriate norms. An intermediate category of significance will likely include concerns associated with the relatively unique technical, operational, and institutional problems of nuclear power such as catastrophic accident, diversion of nuclear materials, and a perceived limitation on civil liberties resulting from security measures to prevent diversion or sabotage. While appropriate arenas exist for the resolution of norms associated with these concerns, intense disagreement will likely continue both with regard to the severity of the risks and as to the means of controlling the risks. But they do not involve as many complicating contextual factors as the most significant concerns.

The objective of the assessment is to determine the potential difficulty of resolving the norm structure represented by each of the alternative nuclear power configurations. Hence, each issue of concern within each of the concern categories is examined to determine how the activities of each of the configurations will affect the issue--alleviate it or exacerbate it. The assessing entity wants to determine what change will occur in each issue of concern and how this will affect the stability and effectiveness of existing norms associated with certain issues or the potential difficulty of resolution of proposed norms to control risks of certain other issues or the continuing controvery over the omission of norms to control risks associated with still other

issues of concern. Each issue of concern has a basic level of difficulty of norm resolution attached to it by virtue of being located in a concern category having a previously determined significance. Change in direction and difference (and the certainty/uncertainty of such change) qualifies this significance level or weight for the particular issue of concern. The alleviation/exacerbation estimates supply an adjustment to the significance level of the particular issue. That is, the estimated difficulty of resolution of the issue is reduced or increased relevant to the significance level of the related concern category.

Alternative configurations can then be compared in terms of the relative number of issues in concern categories of high significance as modified by the level of certainty as to whether alleviations, exacerbations or no change would result. Issues of low probability as to direction and/or large differences of low probability estimated by the assessing entity which come within concern categories of high significance will be potentially the most difficult to resolve. Hence, those configurations predominating with such issues will potentially present the greatest barriers to the establishment and maintenance of their norm structures since they will present numerous opportunties for challenge to the decision process.

To summarize, the concern approach incorporates <u>controversy</u>. An analysis of concerns with respect to a given action provides an indicator of the extent to which such action is likely to be supported or challenged. Concomitantly, this approach directs major attention to the formal or authoritative entities and decision processes requiring an examination of the capability and integrity of the relevant decision process to decide the issues posed. The public's perception of the competence of the decision process involved in a given proposal strongly affects the scope and intensity of all other concerns expressed

in the specific assessment context. Succinctly, one model of the concern approach focuses directly on the ease or difficulty of establishing and maintaining the norm (or norm structure -- policies, statutes, regulations, programs, etc.) associated with the proposed action. Hence, the Congress in particular should be deeply interested in an assessment emphasis and outcome directed to the alleviation or exacerbation of concerns. Both the near term and long term viability of the proposed action largely rests with the impact of public concerns on the authorization and implementation of the proposed action. The public -or at least an influential, prevailing segment -- must be satisfied that the risks involved with the action will be controlled to an acceptable degree. What is "acceptable" will, of course, depend upon the need for or expected benefits of the proposed action as well as the risks (left uncontrolled) and other identifiable costs.

IV. The Legal/Institutional Focus to Assessment

The prior parts of the comment have dealt with the various assessment methodologies: the strict analytical mode; the looser, more flexible NEPA-type benefit/cost approach involving primarily the analytical mode but leavened somewhat by public concerns; and the three models of the concern approach. The types of task-objectives and contexts to which these various models are adaptable have been suggested. One further perspective on the anticipatory assessment function has been employed in several GWU/PPS studies, namely, that of focusing on the "legal/institutional" aspects of a proposed action and the specified or posited alternatives.

However the concept of legal/institutional might be scoped or defined, the basic thrust of most of the studies by GWU/PPS so termed have sought to identify and assess how legal/institutional factors might facilitate or hinder the authorization, implementation, and operations of proposed actions. Selected GWU/PPS studies in this category include:

- o Legal-Institutional Implications of Wind Energy Conversion Systems (WECS)
- o Legal-Institutional Arrangements Facilitating Offshore Wind Energy Conversion Systems (WECS) Utilization
- o Role of State Governments in the Regulation of Civil Aircarrier Airports for the Purpose of Noise Control
- o Models of Judicial Information Flow: The Supreme Court, the Adversary System, and the Flow of Information to the Justices

Several other studies have been primarily of a legal/institutional nature and numerous studies have involved a hard look at these factors among others.

There is a close connection between legal/institutional analysis and the concern approach in the sense that a thorough assessment with respect to each model requires close attention to the ongoing public decision process. Estimating the difficulty of norm resolution requires scrutiny of the competency

of the relevant decision process as a major concern affecting to some extent all of the other concerns in a given context. The legal/institutional mode is a somewhat more narrowly focused way of estimating the ease or difficulty of norm resolution in that it looks at those factors likely to promote or inhibit the authorization, implementation, and operations of a proposed action.

In general, the legal/institutional approach works best in situations where the context is reasonably well identified -- especially the alternative project configurations, the relevant structure of decision, and the affected institutional processes. The intersection of these three components helps to identify specific facilitators and barriers to a proposed action to a much finer degree than reliance merely upon experience, reflection, and superficial inspection of the general context of the proposed action. The legal/institutional approach is an excellent technique for sharpening issues. It also supplies a ready means of identifying how various policy options might alleviate or remove barriers and ease authorization and implementation. This approach is particularly useful in situations where the assessment task and context are relatively well specified. It is less useful in terms of having a unique advantage to other techniques in assessment tasks seeking only a discursive treatment.

The GWU/PPS study on WECS gave considerable attention to the description of the invention of alternative wind energy systems so as to have fairly well defined project configurations to assess in specified social environments. Chapter II of that report gave considerable attention to the environmental characteristics relevant to each of the WECS configurations which were specified as to use, capacity, sponsoring entity, whether utility connected, etc. (See components of project configuration under Part II, Appendix, supra). The analyses of the legal/institutional issues in Chapter III of the WECS report

were treated with respect to each of these configurations. The following table of contents discloses in a very specific manner the WECS application of the legal/institutional approach. (See Appendix A to Part IV). Further, Appendix A to the WECS report sets forth a Functional Matrix for the guidance of those planning an offshore WECS installation.

The GWU/PPS report on Legal/Institutional Arrangements Facilitating Offshore Wind Energy Conversion Systems (WECS) Utilization was a supplementary study which undertook to identify the factors which would enhance or inhibit the development of three alternative policy/program options for offshore installations. This supplementary report summarizes the Appendix A matrix rationale as follows:

III--Legal-Institutional Framework for Assessment Of Offshore WECS

A. Offshore WECS Project Configurations

Project configuration refers to the means by which a given social objective is to be achieved. A fully formulated configuration would specify not only the technological component to be employed but the complete system of institutional arrangements essential to the intended operational functioning of the proposed means. The greater the detail with which the project can be described, the greater the prospects for identifying the specific actions required for the complete process of design, authorization, implementation, and operations and the impacts which will flow from each of these phases.

In pursuing a legal-institutional inquiry into the constraints and incentives relevant to offshore WECS installations, it is advisable to attempt to identify the complete sequence of decisions, actions, and functions which are essential for the movement of the configuration through the various phases. Such actions and functions may be in the nature of compliance (to gain a permit or approval) or of facilitation (incentives). This procedure assists in the identification of all governmental and private sector entities and participants who will be engaged in or otherwise affected by the implementation of the project in the relevant social contexts. By giving greater specificity to the zone of interactions at each phase, this approach assists in the identification of the full scope of inevitable, probable, and possible effects which will flow from the complete process of implementation.

Several offshore WECS configurations related primarily to location and unit structural design might easily be identified, including:

- o Fixed platform units within the three mile limit
- o Artificial island within the three mile limit
- o Fixed platform units on the Outer Continental Shelf - beyond the three mile limit
- o Artificial island on the Outer Continental Shelf - beyond the three mile limit
- o Moored WECS units (such units likely having legal status of "vessel") located within the three mile limit; on the Outer Continental Shelf beyond the three mile limit; and on the high seas.

The two basic variables by no means define a complete project configuration. Additional supporting arrangements would specify requirements, if relevant, such as the number of WECS units to be deployed, the site of the installation proposed, storage auxiliaries, transmission systems for electrical power or gas, interconnection arrangements with onshore utilities, and plans for ownership, funding, and managements.

B. WECS Functional Matrix

A useful matrix of significant legal-institutional decisional contexts relevant to offshore WECS can be made by aligning the necessary or likely functions and actions required in sequential order with the affected governmental and private sector entities, indicating the governing statutory authority which would be invoked.[2] Clearly, some functions are not completed at a particular point, but may continue throughout the entire process of planning to operation. Further it would seem advisable, perhaps essential, that substantially complete arrangements be made or assured for every critical element in the WECS project implementation prior to the time that any significant investment is made in construction yards or in WECS units. The matrix undertakes to set forth a time sequence listing of functions under the general headings of Initiation, Authorization/Approval, Implementation, and Operations in order to provide some insight into the scope of the task which might be involved.

The matrix attempts to specify the essential functions and necessary actions relevant to the full implementation of an offshore WECS installation whatever the technical configuration and location and to identify federal and state statutory authority which may control or in some manner affect such functions and actions. The relevance of particular statutory schemes obviously depends upon such factors as the location (territorial waters, Outer Continental Shelf, high seas), the types of structural unit (platform, artificial island, moored unit), and the legal status of such units (vessel or non-vessel). Specific WECS configurations set forth above can be checked through the matrix in order to determine the relevance of existing statutes to each configuration as well as to identify statutory deficiencies with respect to particular functions and actions.

The matrix should be useful to the analysis of a proposed offshore WECS project whether it is to be undertaken under existing statutory authority or under a modified legal structure designed expressedly to facilitate the deployment of offshore WECS. The existing statutes and agency responsibilities relating to offshore mineral exploitation have been noted to some extent for the purpose of suggesting parallel authority and responsibilities which would be specifically relevant to offshore WECS. The relevance of certain statutory authority and the manner in which specific functions may be carried out will vary depending upon whether the proposed installation is initiated and funded by a private sector entity, by a governmental entity, or by a joint arrangement. Further, certain statutes will be relevant only to WECS units classified as "vessels" rather that as "fixed structures" or artificial islands.

A condensed one page outline of the Functional Matrix is shown on the next page. Also Appendix B to Part IV herein includes pages 288 through 307 showing the sequence of functions under the Authorization Stage in detail of the expanded Functional Matrix of Appendix A of the basic WECS report. The Initiation, Implementation, and Operational Stages are omitted. The complete matrix includes pages 283 through 320.

Outline of Offshore WECS Functional Matrix

The following outline listing of functions and actions provides some insight into the scope of the task involved:

I. Initiation

A. Feasibility Studies:
- Technology
- Locations
- Resources

B. R&D:
- WECS
- Storage
- Other

C. Demonstration Projects

D. Preliminary Structuring of Arrangements:

- *Overall management of WECS Implementation and Operation
- *Financing: Public / Private
- *WECS Location/Siting & EIS
- *Wind Field Lease Provisions
- *WECS Construction Yards
- *Dredging, Mooring, Towing
- *Utility Interconnection
- *Conflicting Wind Field Use Resolution
- *Risk Sharing/Insurance
- *Pollution Control
- *Environmental Impact
- *States re Land/Sea Use
- *Safety: Navigation
- *WECS: Servicing & Maintenance
- *WECS: Security

II. Authorization/Approval

A. WECS Project Configuration Design

B. Siting: WECS units, including storage: (Pre-leasing clear-EIS hearings, Fed./State Cooperation)

C. Siting: Transmission Lines/Cables, Pipelines Onshore Facilities

D. Dredging Approval: Cables / OCS Moorings

E. Lease-Sale: Wind Field Uses

F. Funding Arrangements: (Securities Issues, Leasing, Public Sources)

G. Liability Claims and Insurance Coverage

H. Structuring Arrangements: Continue as Necessary

III. Implementation

A. WECS Construction

B. Fabrication all Supporting and Auxiliary Equipment: Storage System, Cables, Moorings, Generators, Etc.

C. Inspection WECS Units and Auxiliaries (during & after construction)

D. Dredging Operations: Cables, Moorings

E. Measurement/Documentation of WECS Units

F. Towing WECS to Wind Fields and Installation on Platforms or by Moorings

G. Installation of Transmission Lines or Cables

H. Pollution Control

I. Rate Setting Hearings

J. Complete Structuring Arrangements

IV. Operations

A. Managerial Operations of WECS

B. Application of Safety Regulations:
- Life - Emergency Procedures
- Property in Navigable Waters

C. Pollution Control

D. Hazardous Substance Liability

E. Ocean Resource Conservation

F. Labor Standards

G. Offshore Maintenance and Inspections

H. Onshore Maintenance and Inspections

I. Onshore Overhaul of WECS

J. Eventualities: Pipeline Accident Investigations

K. Communications Interference

L. Air Flight Interference

M. Termination Arrangements

APPENDIX A TO PART IV

TABLE OF CONTENTS

SUMMARY	Page
Foreword	1
A. Summary of Principal Conclusions	3
B. Wind Energy and Its Applications	5
C. Impediments to Implementation of Land-Based WECS	8
1. Problems Involving Interconnections with External Electrical Suppliers	8
2. Zoning	9
3. Utility Certification Procedures	10
4. Obstruction of the Wind Flow	10
5. The Absence of "Equal" Financial and Tax Treatment for WECS	10
6. Building, Safety and Housing Codes	11
7. The Uncertain Statutory Authority for WECS Utilization by the Interior Department's Federal Utilities	11
8. FCC Regulation	11
9. Other Impediments to the Utilization of Land-Based WECS	12
D. Legal Facilitators of Land-based WECS	13
E. Favorable and Unfavorable Applications for Land-based WECS	14
F. Legal Issues Involved with Offshore WECS Arrays	18
1. Introduction	18
2. Ocean Zones and the Legal Concerns Relevant to Them	19
a. Internal Waters and the Territorial Sea	19
b. The Outer Continental Shelf	22
c. The High Seas	24
3. The "Vessel" Issue and Its Implications	25
4. Conclusions	26
G. Concluding Comments	30

Chapter		Page
I.	INTRODUCTION	31
	A. Purposes	31
	B. Methods	31
	C. Organization	33
II.	THE TECHNICAL, SOCIAL AND ECONOMIC CONTEXT	35
	A. Wind Energy and Its Applications — An Overview	35
	B. Wind Energy Project Configurations and Their Environments	41
	1. A Description of the Configurations	41
	• Configuration I-A: Small, "Urban," Connected	43
	• Configuration I-B: Small, Farm, Connected	43
	• Configuration I-C: Small, Farm or Isolated (Rural), Unconnected	44
	• Configuration II-A: Medium, "Urban," Connected or Unconnected, Supplying Power to Self	45
	• Configuration II-B: Medium, Connected or Unconnected, Group or Community Supplying Power to Members	45
	• Configuration III-A: Large, "Privately"-Sponsored, Providing Electrical Service to Others	46
	• Configuration III-B: Large, Existing Utility-Sponsored, Providing Electrical Service to Others	47
	• Configuration III-C: Large, Federal Corporation or Utility	47
	2. Social Environments and Their Features	49
	a. Social-Geographical Context	49
	b. Public Attitudes	49
	c. Land Availability and Cost	50
	d. The Structure and Operation of the Electric Utility Industry	50
	i. Structure	50
	ii. Units and Loads	52
	iii. Rate-making and Rate Schedules	53
	e. Financing	54
	C. Social Effects	56
	1. Positive or External Effects	57
	2. Negative or Internal Effects	60
	a. Failure to Obtain Financing	60
	b. The Availability Problem	61
	c. Cost Competitiveness	64
	d. Other Negative or Internal Effects	68

Chapter		Page
III.	LEGAL-INSTITUTIONAL ISSUES RELATING TO LAND-BASED WIND SYSTEMS	70
	A. Existing Legal Standards Specifically Relating to Wind Systems	70
	B. Public and Private Regulation of Siting, Construction and Operational Externalities	72
	1. Local Public Land Use Management and Control Processes	72
	a. Zoning	73
	b. Safety, Building, and Housing Codes	79
	2. Federal and State Public Land Use Management and Control Processes	83
	a. Power Plant Siting Statutes	84
	b. Coastal, Navigable Waters, and Wetland Protection Statutes	85
	c. Environmental Policy Statutes	86
	d. Historic Preservation Statutes	89
	e. Water Pollution Control Statutes	90
	f. Noise Pollution Control Statutes	91
	g. Wildlife and Plant Protection Statutes	92
	h. Federal Aviation Administration (FAA) Height Standards	93
	i. Federal Communications Commission (FCC) Regulation	94
	j. Federal Lands	95
	3. Private Land Use Controls	98
	4. Access to the Wind	100
	5. Alternative System Concepts	104
	Summary: Land-Use-Related Legal Considerations	108
	C. Utility Regulatory Problems	111
	1. Electric Utility Regulation and Certification	111
	a. Commission Jurisdiction	111
	b. Franchises and Certificates	114
	2. Commission Compulsion of Wind Utilization	118
	3. Federal Utilities (Configuration III-C)	119
	4. Interconnection Problems	122
	a. Self-Supplying WECS Applications	122
	i. Commission Compulsion of Service and of an Interconnection	122
	ii. Rate Structure	125
	iii. Other Commission Regulation	127
	iv. A Concrete Case	128
	b. WECS Electrical Suppliers	129
	i. The State Commission's Role	129
	ii. The FPC's Role	129
	iii. Purchases from Federal Utilities	131
	Summary: Incidence of Major Utility Regulatory Concerns	133

Chapter		Page
III.	D. The Funding of Wind Energy Conversion Systems	135
	1. Federal Financial Assistance	135
	a. The Small Business Administration (SBA)	136
	b. Farmers Home Association (FmHA)	137
	c. Veterans Administration (VA)	139
	d. Department of Housing and Urban Development (HUD)	140
	e. Rural Electrification Administration (REA)	141
	2. State Loan Programs	142
	a. Research and Development	142
	b. General Loans Applicable to WECS	143
	3. State Tax Subsidies	144
	4. Federal Tax Considerations	147
	a. Accelerated Depreciation	147
	i. Bonus Depreciation	148
	ii. Real Estate Depreciation	149
	iii. The Class Life ADR System	149
	b. Investment Tax Credit	150
	c. Nonrecourse Loans	151
	d. Interest Deduction	152
	e. Investment Vehicles	153
	i. Limited Partnership	153
	ii. The Subchapter S Corporation	155
	iii. General Corporation	155
	5. Securities	156
	a. Federal Regulation—the Securities and Exchange Commission	156
	b. State Registration	158
	c. Special Regulation of Public Utilities	159
	Summary: Incidence of Tax and Financial Considerations	160
	E. Liabilities, Duties and Responsibilities of WECS Owners and Others for Hazards and Defects	163
	1. Liabilities, Duties and Responsibilities of the WECS Owner	163
	a. Operational Liability	163
	i. Strict Liability	163
	ii. Negligence	164
	iii. Nuisance	168
	iv. Immunities	171
	b. The Occupational Safety and Health Administration (OSHA)	172
	c. Insurance	174
	2. Liability of WECS Manufacturers and Sellers	176
	a. Negligence	176
	b. Warranty	180
	c. Strict Liability	184
	d. Misrepresentation	185
	e. Performance and Quality Standards	187

Chapter			Page
III.	F.	Overall Legal-Institutional Viability--Configuration by Configuration	188
		• Configuration I-A: Small, "Urban," Connected	188
		• Configuration I-B: Small, Farm, Connected	192
		• Configuration I-C: Small, Farm or Isolated (Rural), Unconnected	196
		• Configuration II-A: Medium, "Urban," Connected or Unconnected, Supplying Power to Self	199
		• Configuration II-B: Medium, Connected or Unconnected, Group or Community Supplying Power to Members	202
		• Configuration III-A: Large, Privately-Sponsored, Providing Electrical Service to Others	207
		Configuration III-B: Large, Existing Utility-Sponsored, Providing Electrical Service to Others	211
		Configuration III-C: Large, Federal Corporation or Utility	214
IV.	LEGAL-INSTITUTIONAL ASPECTS OF OFFSHORE WECS CONFIGURATIONS		216
	A.	Offshore WECS Project Configurations	216
	B.	Legal-Institutional Questions Posed by Offshore WECS	217
	C.	The Ocean Regime	219
		1. Explicit Wind Energy Controls	219
		2. Internal Waters and the Territorial Sea	220
		3. Contiguous Zones	221
		4. International Waters	221
		a. Continental Shelf	221
		b. Exclusive Economic Zone	223
		c. High Seas	225
	D.	Federal and State Jurisdiction Over Offshore Activities	225
		1. The Territorial Sea	225
		2. The Outer Continental Shelf	227
	E.	The Vessel Issue	227
		1. Vessel Status	227
		2. U.S. Coast Guard (USCG) Regulation of Vessels	228
		3. Liabilities and the Vessel Issue	231
		4. Unions and Insurance	233
		5. Miscellaneous Advantages of Vessel Status	234
	F.	Primary Legal-Institutional Implications Relating to the Siting, Approving, Implementing and Regulating of WECS Configurations	235
		1. Siting Considerations and Statutory Schemes for Implementing Offshore WECS Facilities	235
		2. Legal-Institutional Requisites for Offshore WECS Utilization	239
		a. In General	239

Chapter		Page
IV.	b. By Configuration.	247
	• Configuration #1: Fixed Platforms within the Three-Mile Limit	247
	• Configuration #2: Artificial Islands within the Three-Mile Limit	249
	• Configuration #3: Fixed Platforms on the Outer Continental Shelf (OCS) beyond the Three-Mile Limit, and	
	• Configuration #4: Artificial Islands on the OCS, beyond the Three-Mile Limit. . .	249
	• Configuration #5: Moored Units on the OCS, beyond the Three-Mile Limit.	253
	Configuration #6: Moored Units beyond the OCS of the Coastal State.	254
	G. Assessment of the Existing Legal-Institutional Structure for Offshore WECS Utilization.	256
	1. Legal-Institutional Support for Offshore WECS Utilization	256
	2. Legal-Institutional Constraints on Utilization of Offshore WECS.	258
	3. Concluding Comments	260
V.	FINDINGS, RECOMMENDATIONS AND CONCLUSIONS	263
	A. Findings.	263
	1. Introduction.	263
	2. Major Impediments to WECS Implementation.	264
	a. Problems Involving Interconnections with External Electrical Suppliers.	264
	b. Zoning.	264
	c. Utility Certification Procedures.	265
	d. Obstruction of the Wind Flow.	265
	e. The Absence of "Equal" Financial and Tax Treatment for WECS	265
	f. Building, Safety and Housing Codes.	266
	g. The Uncertain Statutory Authority for WECS Utilization by the Interior Department's Federal Utilities	266
	h. The Absence of a Federal Statutory Scheme Establishing Regularized Procedures for Offshore WECS Initiatives by Non-Federal Entities	266
	i. FCC Regulation.	267
	j. The Time, Expense and Effort Consumed by the Relevant Permit Procedures.	267
	3. Favorable and Unfavorable Applications.	267

Chapter		Page
V.	B. Recommendations for Legal Institutional Changes	272
	C. Concluding Comments	274

APPENDIX

A.	PHASES IN THE DEPLOYMENT OF OFFSHORE WIND ENERGY CONVERSION SYSTEMS (WECS) CONFIGURATIONS.	277
	A. Offshore WECS Project Configurations.	277
	B. WECS Functional Matrix.	280

APPENDIX B TO PART IV

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
II. AUTHORIZATION/ APPROVAL A. WECS PROJECT CONFIGURATION DESIGN (including WECS specifications)	1. "Lead Agency"	Pursuant to the Energy Reorganization Act of 1974, the Solar Energy Research, Development, and Demonstration Act of 1974, and the Federal Nonnuclear Energy Research and Development Act of 1974, ERDA would have "lead agency" status for limited types of offshore WECS installations (Demonstration or Pilot Projects)	No "lead agency" is designated as of 1/1/77. Under existing statutes and organizational arrangements, ERDA, DOT, NASA or the Dept. of Interior (U.S.G.S.) might be candidates for this responsibility under new legislation designed to encourage major private sector offshore WECS initiatives. DOT was designated the lead agency under the Deepwater Port Act of 1974, PL 93-627, 93rd Cong., H.R. 10701, Jan. 3, 1975; 33 U.S.C. §1501, 88 Stat. 2126. See Sec. 4(a). See discussion preceding Matrix relating to WECS Project Configurations wherein it is emphasized that the applicability of the existing legal/institutional structure to offshore WECS implementation or the design of a legal/institutional structure for the implementation of offshore WECS configurations which may be feasible under the existing structure will be intimately related to the ownership/managerial arrangement to be employed. In this connection see relevant legal/institutional sections of the Report on the Planning and Evaluation Parameters For Offshore Complexes by Sincoff, Dajani, Editors, NASA CR - 145040, 1976. See pp. 41-44 in particular.
	2. ERDA	See I-A-2. I-A-5. I-B-1.	The design of limited demonstration or pilot project configurations would lie with the Administrator of ERDA in consultation with other Federal/State entities or also with private sector entities pursuant to arrangements under authority noted in I-A-7.
	3. Private Entity: Utility Insuror Other	See II-A-2.	See II-A-2.
	4. Corps of Engineers	See II-B-1.	See II-B-1.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	5. USCG	See II-B-2.	If OCS WECS units are classified as vessels, the Coast Guard would certify after plan approved and inspection requirements applied to all U.S. flag vessels. See II-B-2 and III.A. See discussion in Higgins, infra, p. 19, at II-B-8. It notes statutory definition of vessel in 1 U.S.C.A. §3 as "every description of watercraft or other contrivance used or capable of being used as a means of transportation on water."
	6. DOT	The Natural Gas Pipeline Safety Act of 1968, 49 U.S.C.A. §1671 et seq., gave the Secretary of Transportation authority to promulgate "minimal Federal Safety standards for the transportation of gas and pipeline facilities." Applicable standards are found at 49 C.F.R. Parts 191 and 192. 49 U.S.C.A. §1672(b) allows the Secretary to grant a waiver of compliance if "not inconsistent with pipeline safety."	Such standards may apply to the design, installation, inspection, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities. . ." §1672. 49 U.S.C.A. §1671 provides: "2) 'Gas' means natural gas, flammable gas, or gas which is toxic or corrosive; 3) 'Transportation of gas' means the gathering, transmission or distribution of gas by pipeline or its storage in or affecting interstate or foreign commerce [except in rural locations or, areas exempted by the Secretary] 4) 'Pipeline facilities' includes without limitation, new and existing pipe rights-of-way and any equipment facility or building used in the transportation of gas or the treatment of gas during the transportation but 'rights-of-way' as used in this chapter does not authorize the Secretary to prescribe the location of routing of any pipeline facility . . . 8) 'Interstate Transmission Facilities' means pipeline facilities used in the transportation of gas which are subject to the jurisdiction of the Federal Power Commission under the Natural Gas Act . . ." The definition of "transportation of gas" in 49 U.S.C.A. §1671(3) appears to make the Act an "affecting commerce" type statute i.e., it may be applicable even to intrastate sales. However, the Act does provide an exemption in Continued

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	6. DOT, continued		§§1672(b) and 1674 for facilities not subject to the jurisdiction of the Federal Power Commission under the Natural Gas Act (The Natural Gas Act is an "in interstate commerce"-type state). This exemption is a narrow one though. It grants primary regulatory power pursuant to §1674 to a state agency which has adopted federal minimum standards. The only leeway appears to be through §1672(b), which allows additional or more stringent standards not inconsistent with Federal minimum standards. 49 U.S.C.A. §1673 directs the Secretary to establish a Technical Pipeline Safety Standards Committee.
B. SITING (WECS units, including storage facilities) Pre-Leasing Clearances, EIS Hearings, Fed./State Cooperation	1. Corps of Engineers	Outer Continental Shelf Lands Act 43 U.S.C. §§1331-1343 (Supp. 1975) Sec. 1333(f) provides: (f) The authority of the Secretary of the Army to prevent obstruction to navigation in the navigable waters of the United States is hereby extended to artificial islands and fixed structures located on the outer Continental Shelf. See 33 C.F.R. §209.120(p) re authority to issue or deny permits.	43 U.S.C. §§1331-1343 (Supp. 1975). Sec. 4(a)(1) of the Act, 43 U.S.C. §1333(a)(1), provides: Sec. 4. Laws Applicable to Outer Continental Shelf.--(a)(1) The Constitution and laws and civil and political jurisdiction of the United States are hereby extended to the subsoil and seabed of the Outer Continental Shelf and to all artificial islands and fixed structures which may be erected thereon for the purpose of exploring for, developing, removing, and transporting resources therefrom, to the same extent as if the Outer Continental Shelf were an area of exclusive Federal jurisdiction located within a State: Provided however, That mineral leases on the Outer Continental Shelf shall be maintained or issued only under the provisions of this subchapter. See 33 C.F.R. §209.120(b)(2) re assertion of jurisdiction and permitting authority under §1333(f) over siting of artificial structures and fixed islands located on the OCS without regard to their use in exploration or extraction of resources, despite an apparent limitation in the Act to siting such structures which are involved in exploration and removal of resources.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	2. USCG	14 U.S.C. §2 (Supp. 1975). Pursuant to this authority the Coast Guard has responsibility for the enforcement of all applicable Federal laws on and under the high seas and navigable waters of the U.S. It administers the laws and regulations to promote safety of life and property on the high seas and navigable waters, and the establishment and maintenance of aids to navigation for the promotion of safety on the high seas and waters subject to the jurisdiction of the U.S.	No direct siting authority for WECS configurations. But see 41 Fed. Reg., No. 79, Part 148 concerning the U.S.C.G.'s role re "content, submission, and review of deepwater port license applications" and "rules governing activities involved in site evaluation and preconstruction testing at potential offshore oil port locations and related onshore terminal facilities." Subpart E spells out the procedure with respect to Site Evaluation. See also 33 C.F.R. §209.120 (g)(8) re Corps of Engineers coordination with U.S.C.G. re the placing of non-Federal fixed and floating aids to navigation in view of the "particular interest to the U.S. Coast Guard because of their control of marking, lighting and standardization of such navigation aids" and use of a "letter of permission" for authorization of such aids.
	3. DOD	18 U.S.C. §2152 (Supp. 1975). See also 43 U.S.C.A. §1341(d) re defensive sea areas and suspension of leases. See Feliciano v. U.S., 297 F. Supp. 1356 (D.C.P.R. 1969); Perko v. U.S., 204 F.2d. 446 (8th Cir. 1953), cert. den., 346 U.S. 832, 74 S.Ct. 48 (1953). (Upholding statutory delegation.)	Approval of DOD required in "defensive sea areas" for purposes of national security. Bureau of Land Management/ U.S. Dept. of Interior advises.
	4. U.S.G.S.	43 U.S.C.A. §31 (a) establishes a Geological Survey under the Director of the Geological Survey. Operation is under the direction of the Department of Interior (See also 43 U.S.C.A. §1457).	Consult re avoiding conflicts on ocean area users: mineral protection v. energy generation. 43 U.S.C.A. §31 (a) provides, in part, for "classification of public lands and examination of the geological structure, mineral resources, and products of the national domain." 43 U.S.C.A. §31 (b) authorizes the Secretary of the Interior, acting through the Geological Survey to make such examination "outside the national domain" where determined by the Secretary to be in the national interest. Continued

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	4. U.S.G.S., continued		Evaluates data and provides advice to BIM regarding areas proposed for leasing; approves production plans and supervises operations conducted under BIM Oil & Gas Leases. FER II-4. See detailed functions at FER F-4. Reference to study of April 1974 entitled Federal Regulation: An Organizational Study re Federal Agency responsibilities for energy development. (Hereinafter referenced as FER and Appendices by letter F or G or H).
	5. NOAA	(1) 5 U.S.C. App., Reorganization Plan No. 4 of 1970. The Plan established the National Oceanic and Atmospheric Administration within the Department of Commerce.	(1) Under Reorganization Plan No. 4 of 1970, the following programs were moved into NOAA: (1) Environmental Science Services Administration (ESSA) (from the Department of the Interior) a) Weather Bureau b) Coast and Geodetic Survey c) Environmental Data Service d) National Environmental Satellite Center e) ESSA Research Laboratories (2) Ocean-related activities of the Bureau of Commercial Fisheries (from the Department of the Interior) (3) The marine sports fish program of the Bureau of Sports Fisheries and Wildlife (from the Department of Interior). See 16 U.S.C.A. §760(e) (4) Marine Minerals Technology Center of the Bureau of Mines (from the Department of Interior) (5) The Office of Sea Grant Programs (from the National Science Foundation) (6) Elements of the U.S. Lake Survey (from the Department of the Army)
		(2) Under 42 U.S.C.A. §5554-5554(b), the chairman of the Solar Energy Coordination and Management Project is directed to work through NOAA in planning and inventoring solar energy resources, making surveys, disseminating information, and making appropriate recommendations for legislation.	The Project was created by the Solar Energy Research, Development, and Demonstration Act of 1974, 42 U.S.C.A. §5551 et seq. See I-A-5. Continued

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
		(3) As part of the Marine Protection, Research, and Sanctuaries Act of 1974, 33 U.S.C.A. §1401 et seq., the Secretary of Commerce is directed and empowered to conduct research concerning ocean dumping and man-induced changes of ocean ecosystems. See 33 U.S.C.A. §1441 et seq. NOAA has promulgated regulations pursuant to a delegation of authority from the Secretary of Commerce. See 15 C.F.R. Part 922. Under 16 U.S.C.A. §1432(a), the Secretary of Commerce, after consultation with appropriate federal agencies and approval of the President, "may designate as marine sanctuaries those areas of the ocean waters, as far seaward as the outer edge of the continental shelf as defined in the Convention of the Continental Shelf (15 U.S.T. 74; TIAS 5578 . . .) which he determines necessary for the purpose of preserving or restoring such areas for their conservation, recreational, ecological, or esthetic values. . ." Note that under 16 U.S.C.A. §1432(b), a governor of a state may certify a certain area as unacceptable as a marine sanctuary in which case the designated sanctuary will not include the area certified as unacceptable.	Continued

FUNCTION	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
II.		(4) The Coastal Zone Management Act of 1972, 16 U.S.C.A. §1451 et seq., authorized the Secretary of Commerce to make grants to states for development of a management program for the land and water resources of its coastal zone upon approval of plans which are submitted. 16 U.S.C.A. §1453 defines "coastal zone." Basically, it means "the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder)..." 16 U.S.C.A. §1455(c) provides that the Secretary of Commerce shall find, inter alia, that: "The management program provides for adequate consideration of the national interest involved in the siting of facilities to meet requirements which are other than local in nature." The program is administered by NOAA under regulations in 15 C.F.R. Parts 920, 926. See also 15 C.F.R. §920.41 (delegation of authority to NOAA).	Note re coordination of activities regarding research, approval, and operation. See also 16 U.S.C.A. §1456. This provision directs the Secretary of Commerce to "consult with, cooperate with, and, to the maximum extent practicable, coordinate his activities with other interested Federal agencies." 16 U.S.C.A. §1460 provides: "The Secretary is authorized and directed to establish a Coastal Zone Management Advisory Committee to advise, consult with, and make recommendations to the Secretary on matters concerning the coastal zone." Note 16 U.S.C.A. §1456(f). It provides the requirements of the Federal Water Pollution Act (33 U.S.C.A. §1251 et seq.) and the Clean Air Act (42 U.S.C.A. §1857 et seq.) shall be met. See NOAA: Coastal Zone Management: Program Development Grants, 41 Fed. Reg., No. 235, Dec. 6, 1976, 15 C.F.R. Part 920; Coastal Zone Management: State Administrative Grants, 41 Fed.Reg., No. 252, Dec. 30, 1976, 15 C.F.R. Part 923; Coastal Energy Impact Program: Proposed Regulations for Financial Assistance to Coastal States, 41 Fed. Reg., No. 206, Oct. 22, 1976, 15 C.F.R. Part 931. See Baram, Michael, Environmental Law and the Siting of Facilities: Issues in Land Use and Coastal Zone Management (Cambridge, Mass.: Ballinger Publishing Co., 1976).
	6. U.S.Fish & Wildlife Service	16 U.S.C.A. §742b established within the Department of Interior the United States Fish and Wildlife Service and a Director of the Service.	The United States Fish and Wildlife Service replaces the United States Fish and Wildlife Service (as constituted on June 30, 1974) and the Bureau of Sport Fisheries and Wildlife (as constituted on June 30, 1974).

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	7. BIM	See I-A-5. A division of "lead agency" authority exists within the Dept. of the Interior between leasing of mineral deposits on the OCS and granting of pipeline rights-of-way (BLM) and the conduct of mineral operations and development on the OCS (U.S.G.S.). See Regulations Pertaining to Mineral Leasing, Operations and Pipelines on the OCS, Dept. of the Interior, 1975, Title 30 and 43 of Code of Federal Regulations.	BIM has responsibility to prepare and review EIS concerning the exploration and development of energy minerals. FER F-4. National Environmental Policy Act of 1969, 42 U.S.C.A. §4321 et seq. 42 U.S.C.A. §4332, inter alia, requires federal officials to make a detailed statement of environmental impact pursuant to recommendations on proposals for legislation and "other major Federal actions significantly affecting the quality of the human environment." For a general review of the Environmental Impact Statement Process see Environmental Quality -- 1976 (The Seventh Annual Report of the Council on Environmental Quality - September 1976), at p. 122. Specifically, see Final Environmental Statement of the Proposed 1976 Outer Continental Shelf Oil and Gas General Lease Sale, Gulf of Mexico, OCS Sale No. 41. Prepared by the Bureau of Land Management; and Draft Environmental Statement of the Proposed 1976 Outer Continental Shelf Oil and Gas Lease Sale, Offshore the Mid-Atlantic States, OCS Sale No. 40. Prepared by the Bureau of Land Management.
	8. States & Municipalities	See II-B-5(4) Citations and Comments. The Submerged Lands Act, 43 U.S.C.A. §§1301-1315 (Supp. 1975) at §1311(d) states that "nothing in this chapter shall affect the use, development, improvement or control by or under the constitutional authority of the U.S. for the purposes of...production of power...."	States, under existing law, would share jurisdiction with Corps of Engineers and the Coast Guard on WECS units within the 3-mile territorial sea. See Higgins, James C., Jr., "OTEC: Federal & State Regulatory Aspects," Ocean Thermal Energy Conversion Workshop Materials, American Soc. Int'l L., Jan. 15-16, 1976, Wash., D.C. at 39-43, re State Power Plant Siting Acts & Coastal Zone Management Plans. See also the Submerged Lands Act re jurisdiction of states. Continued

FUNCTION	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
II.	8. States & Municipalities, continued		§307(e) of the Coastal Zone Management Act, 16 U.S.C.A. §1456 states that "nothing in this chapter shall be construed to diminish... Federal... jurisdiction, responsibility to rights in the field of planning, development, or control of water resources, submerged lands, or navigable waters..." However, the policy of the Act, §303, 16 U.S.C.A. §1452 is to promote cooperation between the Federal Government and the States. Under the Coastal Zone Management Act, 16 U.S.C. §1456(c) provides that after a State's management program has been approved, any applicant for a federal license or permit must obtain certification that the activity is and will be conducted in a manner consistent with the program. If a state refuses, no license will be granted unless the Secretary finds the activity consistent with the Act or "otherwise necessary in the interest of national security." It may be noted that under the Submerged Lands Act, 43 U.S.C.A. §1301 et seq., the U.S. retained its power and rights in the lands and waters of the territorial seas for the purpose of "production of power" (at §1311(d)) and for the regulation and control of "commerce" (at §1314). While these reservations create a potential for federal preemption of state regulation, the Congressional intent here was probably only to retain rights concerning hydroelectric power and shipping. For general background see Coastal Effects of Offshore Energy Systems: An Assessment of Oil and Gas Systems, Deepwater Ports, and Nuclesr Powerplants Off the Coast of New Jersey and Delaware (Office of Technology Assessment, U.S. Congress, 1976).

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
C. SITING (Transmission and On-Shore facilities)	1. Corps of Engineers	River and Harbor Act of 1899, Sec. 10. 33 U.S.C. §403 (Supp. 1975). See also Sec. 404 of Federal Water Pollution Control Act of 1972 (FWPCA) §502(7) FWPCA, 33 U.S.C.A. §1362 (Supp. 1975). 33 U.S.C. §1344 (Supp. 1975). Sec. 404(a) provides: Sec. 404. (a) The Secretary of the Army, acting through the Chief of Engineers, may issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into the navigable waters at specified disposal sites. For purposes of this Sec. 404 "navigable waters" means waters of the United States including the territorial seas. See Fed. Reg., 40, No. 144, Part 209.120 (d)(2).	Secretary of Army must authorize any activity altering the conditions of any navigable waters. Applies to building of any structure or removal of material (dredging), or implantation of mooring equipment or laying of cable. §1413. Dumping permit program for dredged material—Issuance by Secretary of the Army (a) Subject to the provisions of subsections (b), (c), and (d) of this section, the Secretary may issue permits, after notice and opportunity for public hearings, for the transportation of dredged material for the purpose of dumping it into ocean waters, where the Secretary determines that the dumping will not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. Navigable waters include the "territorial seas." See 43 U.S.C. §1333(f) at II-B-1 and 33 C.F.R. 209.120.
	2. President (DOD)	See II-B-3.	See II-B-3.
	3. EPA	FWPCA of 1972, 33 U.S.C.A. §1362 (1975). See II-C-1. EPA has permit authority for discharges of non-dredged materials (pursuant to FWPCA) and dumping of non-dredged materials (under the ODA) while the Corps has permit responsibility for discharges (FWPCA) and dumping (ODA) of all dredged and fill material. See 33 C.F.R. 209.120(b)(7)(8).	Sec. 1413(c) of 33 U.S.C. provides: Disagreement of Administrator with determination of Secretary of the Army (c) Prior to issuing any permit under this section, the Secretary shall first notify the Administrator of his intention to do so. In any case in which the Administrator disagrees with the determination of the Secretary as to compliance with the criteria established pursuant to section 1412(a) of this title relating to the effects of the dumping or with the restrictions established pursuant to section 1412(c) of this title relating to critical areas, the determination of the Administrator shall prevail. Unless the Administrator grants a waiver pursuant to subsection (d) of this section, the Secretary shall not issue a permit which does not comply with such criteria and with such restrictions.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	4. BLM	43 U.S.C.A. §1334(c) grants authority to permit rights-of-way through submerged lands of the Outer Continental Shelf for pipeline purposes for transportation of natural gas. 43 U.S.C.A. §959 grants authority to permit rights-of-way through public lands for electrical transmission lines. See Mineral Leasing, Operations, and Pipelines on the OCS re U.S.G.S. authority on Rights of Use and Easement §250.8 and Platforms and Pipelines §250.19. Title 30, Code of Federal Regulations, Part 250.	43 C.F.R. Part 2283 contains regulations promulgated pursuant to this authority. No definition of natural gas is given in the statute or regulations. Regulations governing rights-of-way for transmission lines are found at 43 C.F.R. Part 2850. The proposed site, design, and construction must meet prescribed standards before this license will be granted. The right-of-way (which may be granted under 43 U.S.C.A. §959) is merely a license, i.e., a personal, revocable contract right which may not be transferred by the holder. An easement (which may be granted under 43 U.S.C.A. §959) is an interest in real property, an encumberance on the servient estate, and transferable by the owner. The right-of-way under 43 U.S.C.A. §959 has been construed to be "no more than a revocable permit." U.S. v. Colorado Power Co., 240 F.217, 218 (D.C. Colo. 1916). This conclusion is buttressed by the fact that provision for grant of an easement is made in 43 U.S.C.A. §961.
	5. NOAA INTERIOR: U.S.G.S. & Fish & Wildlife Service	See II-B-5. See II-B-4. See II-B-6.	These agencies would comment on EIS re authorizations for rights-of-way, construction, and operation of gas pipelines or for electrical transmission facilities and would recommend stipulations to be placed in permits.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
(Transmission Pipelines)	6. FPC	Natural Gas Act, 15 U.S.C.A. §717 et seq. 15 U.S.C.A. §717f(c) provides that a certificate of convenience must be granted by the Federal Power Commission to anyone who "shall engage in the transportation and sale of natural gas." 15 U.S.C.A. §717 restricts the scope of the Natural Gas Act to transactions in interstate commerce.	15 U.S.C.A. §717a(5) defines "natural gas" as "either natural gas unmixed, or any mixture of natural and artificial gas." 15 U.S.C.A. §717a(6) defines "natural-gas company" as "a person engaged in the transportation of natural gas in interstate commerce, or the sale in interstate commerce of such gas for resale." Note the operation of 49 U.S.C.A. §1676 (Natural Gas Pipeline Safety Act) under this section: 1) The Secretary of Transportation must consult with the FPC (or relevant State Commission) where establishment of a standard or waiver of a standard under the Natural Gas Pipeline Safety Act would affect continuity of service; and 2) in proceedings under the Natural Gas Act to establish authority to establish, construct, operate, or extend a pipeline, any applicant shall certify that it will comply with the standards of the Natural Gas Pipeline Safety Act in its activities.
(Transmission lines, cables)		Permits under section 10 of the River and Harbor Act (1899) are required for power transmission lines crossing navigable waters of the U.S. unless those lines are part of a water power project subject to the regulatory authority of the FPC under the Federal Water Power Act (1920). Applications for permits for water project transmission lines will be submitted to the FPC. 33 C.F.R. §109.220 (g) (14).	16 U.S.C.A. §797 (of the Federal Power Act, 16 U.S.C.A. §791a et seq.) provides in part: "The Commission is authorized and empowered... (e) To issue licenses... for the purpose of constructing, operating, and maintaining... transmission lines, or other project works necessary for the... development, transmission, and utilization of power... from... any bodies of water over which Congress had jurisdiction under its authority to regulate commerce..." This section was initially passed as part of the Federal Water Power Act. Though the Act was amended to give power to the FPC to regulate rates of electricity in interstate commerce and renamed the Federal Power Act, the operation of the section has been restricted to hydroelectric generating facilities based on its legislative history. (See, for example, Chemehuevi Tribe of Indians v. FPC, 420 U.S. 395 (1975). Thus, it will not be applicable to WECS units.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	7. States/ Municipalities	According to the Submerged Lands Act, 67 Stat. 29 (1953), 43 U.S.C. §1301-1315 (Supp. 1975), the States would have no control over lands and adjacent waters and air space beyond the territorial sea and would not have authority to license a WECS installation beyond the three or nine mile limit. States would clearly have authority over siting, dredging, and operations having to do with on-shore installations such as substations, servicing facilities, heliports. The States would undoubtedly have a strong voice in the siting of pipelines or transmission cables. Many states have "siting" laws or regulations for power plant construction. Some are of the "one-stop" variety. Higgins, supra, at 42. See II-B-8. Coastal Zone Management Act. 16 U.S.C.A. §§1451-1464.	Higgins, Col. II-B-8 supra, at 41. Recognition of this interest (of the States) was made by Congress when, in enacting the Deepwater Port Act of 1974, (88 Stat. 2126 (1975), 33 U.S.C.A. §1501 (Supp. 1975), 40 Fed. Reg. 52539 (1975)) it granted to any State located within 15 miles of any proposed port or any State within whose borders a pipeline from a proposed port is to be constructed the right to disapprove licensing of the facility. A similar voice in the decision-making process relative to Atlantic leases of offshore oil deposits is currently being debated. States have intervened to comment on EIS drafts for off-shore oil leasing. All coastal states apparently have "regulations controlling the use of off-shore lands and waters for other than recreational and normal commercial purposes." Higgins, supra, at 41. Some States are now preparing plans in accord with the provisions and requirements of the Coastal Zone Management Act. See discussion of the action of Florida pursuant to this Act and other institutional arrangements Florida has created which would govern off-shore (territorial sea) construction of transmission cables and land support facilities and cable and support facility right-of-ways. Higgins, supra, at 44. For recent events concerning the activities at the State level on environmental quality, including so-called State "little NEPAs," see Environmental Quality -- 1976 (The Seventh Annual Report of the Council on Environmental Quality - September 1976), at pp. 135. For an extended discussion of this topic see paper on The Legal-Institutional Aspects of Power Distribution from Off-Shore Wind Energy Conversion Systems, working paper prepared in support of this report on Legal-Institutional Implications of Wind Energy Conversion Systems to the National Science Foundation by the Program of Policy Studie in Science and Technology, The George Washington University under NSF Grant APR75-19137 (March, 1977).

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
D. DREDGING APPROVAL (cables, moorings)	1. Corps of Engineers	River and Harbor Act of 1899, Section 10. Marine Protection, Research and Sanctuaries Act of 1972, 33 U.S.C.A. §1411 (Supp. 1975), Sec. 101. Section 3(c) of the Act defines "material" as "matter of any kind or description, including but not limited to, dredged material ...." 33 U.S.C. §1402 (Supp. 1975). A permit is required from Secretary of Army by Sec. 3(b), 33 U.S.C. §1402. The Secretary of the Army has delegated his permitting authority to the Chief of Engineers for all authorizations for work in navigable waters, dredging and filling and ocean dumping. See 33 C.F.R. §209.120(p) (1974).	See II-B-1. This law would appear applicable to the dredging and filling of the seabed re installation of mooring gear or the laying of a pipeline or a power transmission cable. The Administrator of EPA may veto an approval by the Corps of Engineers under certain conditions. Sec. 103(c) of Act. 33 U.S.C. §1413(c). Requests for dredging, filling or siting go to District Engineer. EIS-Public Notice-Hearings-Decision. See Corps Regulations on Dredge and Fill, 33 C.F.R. §209.120 (1974), as amended by 40 Fed. Reg. 31319 (July 25, 1975). Section 209.120(k) sets forth regulations re Public Meetings and §209.120 (l) refers to Environmental Impact Statement. See also Proposed Policies and Procedures Applicable to Corps of Engineers re Environmental Considerations. 33 C.F.R. Parts 307, 308, 309, & 310, Fed. Reg. Vol. 42, No. 36, Feb. 23, 1977, at 10782.
	2. EPA	See II-D-1.	See II-D-1. See also 40 Fed. Reg., Part 230 et seq. re EPA and the discharge of dredged and fill material in the navigable waters of the U.S.
	3. States	See II-C-7.	See II-C-7. See relevant discussion in Rogers, James A., "Ocean Dumping," 7 Env. L., No. 1, Fall 1976, at 1, 3-7.
	4. Municipalities	See II-C-7.	See II-C-7.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
E. LEASE/SALE: Wind Field Uses	1. BIM	Outer Continental Shelf Lands Act, 43 U.S.C.A. §§1331-1343, granted mineral leasing authority in Outer Continental Shelf Lands. (Illustrative Only) See also the Deepwater Port Act of 1974 re License for the Ownership, Construction, and Operation of a Deepwater Port. Sec. 4. See II-B-7.	Consult re avoiding conflicts on ocean area users: mineral protection v. energy generation. See definition of "Outer Continental Shelf," 43 U.S.C.A. §1331. Essentially, it means all land outside the three mile territorial sea. [Mineral leasing authority for other public lands is granted in 30 U.S.C.A. §§181 et seq.] 43 C.F.R. Part 250 contains regulations promulgated pursuant to this authority to be administered by BIM. See discussion of how Licensing and Procedure provisions of the Deepwater Port Act might have relevance to the establishment of Legal/Institutional Arrangements Facilitating Offshore WECS Utilization, working paper prepared in support of this report, Legal-Institutional Implications of Wind Energy Conversion Systems, a report to NSF by the Program of Policy Studies, Geo. Wash. Univ. (NSF APR75-19137)
	2. States/ Municipalities	See II-C-7.	See II-C-7. The BIM has frequently taken into account various State concerns in determining what tracts are to be leased for oil and gas so as not to unreasonably burden State/ Municipality interests. Local representatives regularly participate in Draft EIS Hearing Reviews.
	3. Private Interests: Commercial Fisheries Etc.	See II-B-5. II-B-7.	The BIM takes into account significant private interests in determining what tracts to lease for oil and gas exploration and production such as commercial fishing interests.
F. FUNDING ARRANGEMENTS Securities Issues	1. SEC	The Public Utility Holding Company Act (1935) 15 U.S.C. §79 et seq., provides for SEC jurisdiction over sales of securities by holding companies subject to certain exceptions where state commissions have approval authority.	Thus, §6(b) of the Act provides that if a security issue is expressly to be approved by a state commission, the SEC shall exempt the issue "subject to such terms and conditions as it deems appropriate in the public interest or for the protection of investors and consumers...." 15 U.S.C. §79f(b); City of Lafayette, La. v. SEC, 454 F.2d 941, at 943, note 1 (D.C. Cir. 1971).

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	2. FPC	The Federal Power Act, as amended, 49 Stat. 838 (1935), 16 U.S.C. §824, et seq. (1975), provides for FPC review of securities issues of utilities defined in §201 of the Act, 16 U.S.C. §824. Subsection (b) of §204 provides for broad review and conditioning of securities issues approval "as to the particular purposes, uses, and extent to which... any security...or the proceeds thereof may be applied...." 16 U.S.C. §824c(b) (Supp. 1975). See "Comments" as to limits of public utility definition under §201 of the Act.	Under §201, FPC jurisdiction is limited to those public utilities defined as such by the Act which sell electricity in interstate commerce at wholesale, and, more specifically, the jurisdiction is limited to issues of greater than $500,000 which are not reviewed by a state commission under an express statutory grant to such commission.
	3. State--PUC or other	15 U.S.C. §79f(b); 16 U.S.C. §824c(f) (Supp. 1975); various state statutes provide expressly for review of securities issues of public utilities incorporated within the state. Where such is the case, SEC jurisdiction is limited and FPC jurisdiction is eliminated. 64 Am. Jur. 2d Public Utilities §255 (1972).	
	4. Private--Stockholders	If by-law amendment necessary to increase allowable outstanding shares. See generally 19 Am. Jur. 2d Corporations §161 et seq., (1965). Direct stockholder actions to enjoin issue where, e.g., dilution of value of holdings, 19 Am. Jur. 2d Corporations §525 (1965).	

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
Leasing	IRS	See Rev. Rul. 55-540 (1955-2 Cum. Bull. 39) as to the conditions required to be met in order to qualify as a lease rather than conditional sale.	The lease arrangements must not take on the characteristics of a conditional sale; otherwise the tax advantages which give rise to this financing form disappear, see Rev. Rul. 55-540 (1955-2 Cum. Bull. 39). See generally J. H. Riggs, Jr., "Legal Aspects of Financing Ocean Thermal Energy Conversion Plants," Am.Soc.Int.L. OTEC Workshop Materials, (Jan. 15-16, 1976), re arrangements allowing foreign income tax credits and applicability/inapplicability of investment tax credit.
Public Sources	1. ERDA	See Sec. 7. of the Solar Energy Research, Development and Demonstration Act of 1974, 42 U.S.C. §5551 et seq.; and Sections 4, 7, and 8 of the Federal Nonnuclear Energy Research and Development Act of 1974, 42 U.S.C. §5901 et seq. Title XI of the Merchant Marine Act of 1936 (loans to construct ships--restricted to U.S. citizens). Federal Ship Mortgage Act, 46 U.S.C. §921 et seq.	Sec. 7.(f) of the Solar Energy Act states: If the estimate of the Federal investment with respect to construction and operation costs of any demonstration project proposed to be established under this section exceeds $20,000,000, no amount may be appropriated for such project except as specifically authorized by legislation hereafter enacted by the Congress. Sec. 8.(e) of the Nonnuclear Energy Act states: If the estimate of the Federal investment with respect to construction costs of any demonstration project proposed to be established under this section exceeds $50,000,000, no amount may be appropriated for such project except as specifically authorized by legislation hereafter enacted by the Congress. If certain types of WECS units (moored) be classified as "vessels," the Federal Ship Mortgage Act might provide mortgage loan assistance for a proposed offshore WECS configuration to be developed and managed by an investor-owned utility.
	2. NASA	See I-A-7. See I-B-2. See I-C-2.	See I-A-7. See I-B-2. See I-C-2.
	3. States	See I-A-7.	See I-A-7. A State or a Consortia of States might authorize and appropriate funds on its own initiative for the installation of an offshore WECS within its Territorial Seas.

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
	4. Publicly-Owned/ Municipal	Extension of revenue bonding authority to private, investor-owned utility through contractual agreement. Some states specifically prohibit such cooperation.	Rates charged for power delivered to publicly-owned utility or municipality reviewable by state PUC, 64 Am. Jur. 2d Public Utilities §161 et seq., (1972).
G. LIABILITY CLAIMS AND INSURANCE COVERAGE	* See Comment	Art. III, §2, U.S. Constitution re "...cases in admiralty and maritime jurisdiction..." See also 28 U.S.C.A. §1333 re exclusive jurisdiction of Federal District Courts. Jones Act, 46 U.S.C. §688, 1915. Federal Tort Claims Act, 28 U.S.C. §1742 et seq. (waiver of immunity of U.S. for negligent acts of government employees). See 28 U.S.C. §2620 (exception re claims or suits in admiralty). See Annotation on: Construction And Application Of §4 Of Outer Continental Shelf Lands Act of 1953 (43 U.S.C.S. §1333), relating to Laws Applicable to Subsoil and Seabed of Outer Continental Shelf and Artificial Islands and Fixed Structures Erected Thereon, 30 ALR Fed. 535 (1976). (Numerous relevant citations are included.) See 33 U.S.C.A. §903 re application of LHWCA to disability or death of an employee on the navigable waters (defined to include numerous onshore facilities).	*As with most of the other actions and functions outlined in this Matrix which are relevant to the utilization of offshore WECS configurations, the liability issues and insurance arrangements will vary with the ownership/ management scheme and will depend upon whether the WECS units are classified as "vessels." A useful review of admiralty jurisdiction including several topics which may be of relevance to WECS operations can be found in Annotation on: Admiralty Jurisdiction in Matters of Contract. 29 ALR Fed. 325 (1976). Many helpful citations to cases, articles, and treatises are provided. See also Annotation on: Longshoreman's Strict Liability Claim Against Vessel Owner As Barred By 1972 Amendment of §5 Of Longshoremen's And Harbor Workers' Compensation Act (33 U.S.C.A. §905(b)). 29 ALR Fed. 784 (1976). See discussion of liability issues in Chapter IV of the GWU/WECS Report. For suggestion of types of insurance coverage which would be relevant to various WECS configurations see letter of May 10, 1976 by Comie Barges of The Travelers Insurance Co. (GWU/WECS File) A brief discusssion of insurance topics relevant to offshore complexes is presented in Planning And Evaluation Parameters For Offshore Complexes (Eds. Sinoff & Dajani, NASA CR-145040, 1976, at 157-159). A discussion of offshore WECS insurance problems was also held at a workshop to critique the GWU/WECS report, June 10-11, 1976, The George Washington University. Continued

FUNCTION II.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
			A recent case analyzes many of the intricate issues which arise with respect to marine insurance. See Walter v. Marine Office of America, 537 F.2d 89 (5th Cir. C.C.A. 1976).
H. STRUCTURING OF ARRANGEMENTS: CONTINUE AS NECESSARY			Continuing Structuring Arrangements will take place pursuant to Cooperative Agreements, Contracts, Required Regulatory Procedures previously made. The precise nature of these arrangements will depend upon the proposed project configuration including the ownership/management plan. In any event, the following functions, as relevant to the specific project configuration proposed, must be arranged for: • WECS construction • Fabrication of all supporting and auxiliary equipment • Inspection of WECS units/auxiliaries • Dredging operations • Measurement/documentation WECS units • Towing units to selected sites and installation • Installation of transmission lines or cables • Pollution control procedures Rate making procedures Special attention must also be given to liability and risk sharing/insurance questions prior to the implementation and operation phases.

FUNCTION III.	RELEVANT PUB./PRI. ENTITY	CITATIONS TO AUTHORITY	COMMENTS
III. IMPLEMENTATION A. WECS CONSTRUCTION AND RELEVANT INSPECTIONS (including storage facilities)	1. Government Facility under Supervision of "Lead Agency"	See II-A-1. See II-A-2.	See II-A-1. See II-A-2.
	2. Private Shipyard or other Private Facility	See Sec. 7. of the Solar Energy Act and Sec. 4., Sec. 7., and Sec. 8 of the Nonnuclear Energy Act.	See II-F-1 (Public Sources of Funding)
	3. USCG-General	46 U.S.C. 395(b), 70 Stat. 225 (1956).	Assuming that an OCS WECS unit displaces more than 100 tons, it will probably be classified as a sea-going barge of greater than 100 tons capacity and thus subject to the cited statute which requires Coast Guard inspection and approval prior to being placed into service and every two years thereafter.
	4. Hull and Equipment (USCG)	46 C.F.R. Part 92 (1974). 46 C.F.R. §92.01-10 (1974). American Bureau of Shipping Standards	Rules respecting construction of hull, decks, bulkheads, superstructure, railings, and crew accommodations.
	5. Impact Standards Weather Stability Standards (USCG)	46 C.F.R. §93.07 (1974).	

V. An Illustrative Framework for Evaluating OTA Studies

Major distinguishing features of technology assessment, broadly construed, with respect to particular tasks include:

- o Purpose of the Task-Objective assigned or posited
- o General Subject Matter -- proposed action or an existing policy, program, project or other action
- o Imposed or posited constraints -- conditions
- o Degree of specification
- o Ultimate intent -- to illuminate or to recommend
- o Designation of primary users or user groups

These features have relevance to:

- o Selection of basic technical assessment design -- methodology
- o Selection of appropriate techniques of inquiry
- o Selection of evaluative criteria
- o Selection of appropriate outcome representation

These selections (if not specified in the task objective or otherwise modified by imposed or posited constraints) go far toward determining the adequacy of the assessment outcome.

A basic three column matrix representation can assist the further explication of these features. Column 1 would set forth in much more detailed fashion the conditions within which the assessing entity must perform and the methodological techniques potentially available. This column outlines the constraints and resources which OTA must or might consider for given assessment tasks. Column 2 describes a particular OTA study in terms of the foregoing constraints and techniques employed. It addresses the question: what did OTA do? Column 3 provides analytic and evaluative comment on what OTA might have done (if anything) which would have enhanced the clarity, warrantability, or utility of the study outcome to primary users or user groups. This critique might include consideration of whether the task objective as posed in the first instance was formulated in the most efficacious manner to

produce the highest level serviceability of outcome. The basic matrix form is shown below:

1.	2.	3.
Features of the Technology Assessment Process (Range of Conditions & Stock of Assessment Techniques)	Characteristics of Particular OTA Studies	Comments on Assessment Design & Performance Re Particular Study

The items (illustrative) for Column 1 are elaborated in 10 phases on the following pages.

1. ASSESSMENT TASK-OBJECTIVE (T-O)

Purpose:

- Exploratory -- Uses and Danger of New Technology
- Implications of Proposed Alternative Actions to achieve a Specified Social Goal

  Impacts and Effectiveness of an Existing Policy, Program, Project or other action
- Retrospective Study of Expectations vs. Outcome

Subject Matter: (Implied in points under Purpose)

- New Technology or Technological/Institutional Arrangement
- Existing Action -- utilizing a Mature or Evolving Technology

2. CONDITIONS OF THE ASSESSMENT

Goes to limitations and constraints in the specific assessment context on:

- o Purpose
- o Subject Matter
- o Funding
- o Time
- o Information
- o Modes of Inquiry
- o Evaluative Criteria

3. DEGREE OF SPECIFICATION OF TASK

- o Purpose -- Task Objective
- o Project Configurations -- Alternatives
- o Evolving Social Environment
- o System of Affected Participants
- o Relevant Decision Process(s) -- Initiation, Authorization, Implementation and Operational Stages
- o Effects/Consequences
- o Evaluative Criteria
- o Outcome Presentation

4. ALTERNATIVES -- PROJECT CONFIGURATIONS

- o Not relevant to T-0
- o Alternatives prescribed
- o Alternatives posited -- invented
- o Components of a Project Configuration (P-C)
  - . Precise technology and technological system
  - . Institutional Process -- Authorization, Implementation & Operations
  - . Formal Authority -- Authorization, Implementation & Operations

    Financing/Funding
  - . Management/Administration
  - . Scheduling
  - . Legal Requirements involving Costs: Regulations to be complied with
  - . Essential supporting institutional structure

5. EVOLVING SOCIAL ENVIRONMENT

Social Context Interactions

o Not specified

o Specified

o Posited

o Defined -- as the full social context anticipated to interact with the project configuration and including:

- target activities
- time period projected
- relevant geographical area jurisdictional dimensions -- authoritative (formal) and private sector
- relevant conditioning factors and trends which might be organized in terms of social value-institutional processes (public decision process; process of technological innovation; economic resource allocation; knowledge and skill capabilities; urban and regional developmental processes, societal behavioral patterns; processes of exercising options pertaining to individual well-being; processes affecting the quality of the natural environment, etc.)

o Techniques for Forecasting/Projecting:

- Trend Projection
- Systems Interactive Models
- Alternative Scenarios
  Preferred Futures -- Posited
- Etc.

6. SYSTEM OF AFFECTED PARTICIPANTS (Public & Private Sector)

- o Relevant Decision Makers -- single or multiple hierarchy of review and authorization
- o Others Affected by the Action -- proposed action or existing program
  - Others affecting the process of authorization, implementation and operations
  - Those affected by the process of authorization, implementation
- o Future Generations -- Viability of Evolving Society Concerns related to

All of the above present claims or demands in the arenas of the relevant decision process through which alternatives are authorized or rejected.

7. RELEVANT STRUCTURE OF AUTHORITATIVE AND CONTROLLING DECISION
(Decision Process) (Arenas of Claims/Concerns Resolution)

- o Arenas relevant to particular actions -- existing or proposed
- o Arenas relevant to alternatives of particular actions
- o Process of Formal Authorization -- Prescription/Delegation/ Regulation/Administration
- o Process of Applications and/or Implementation
- o Process of Continuing Appraisal and Modification

8. EFFECTS IDENTIFICATION AND MEASUREMENT

- o TAs almost always involve some aspect of the implications of an existing or proposed action and are therefore to some degree relevant.... However, they are treated quite differently depending upon the task objective...

- o Effects to be identified and measured not specified

- o Effects specified or expected to be identified and measured -- Intended - Unintended - Direct - Immediate - Indirect - Remote

- o Effects assessment can obviously be more readily performed if the context is contained and the significant effects are near term, identifiable, and measurable

- o Modes of Inquiry include:

  - Analogy
  - Surveys
  - Expert opinion
  - Empirical investigation
    Scientific explication
  - Risk analysis
  - Modelling
  - Dialectic - Adversary process
  - Intuitive
  - Heuristic
  - Continuing analysis
  - Demonstration
  - Uncertainty assessment including:
    - Irreversible effects
    - Catastrophic events

9. SOCIAL IMPACT EVALUATION

Caveat: Certain methodologies do not make a sharp distinction between likely effects (facts) and social impacts (value enhancement or deprivation). Certain assessment tasks may not be amenable to such a distinction.

o If only likely Effects are to be identified and measured as per the Task-Objective, then social impact evaluation is not relevant

o Impact evaluation relevant but methodology not specified

o Social Impact evaluation relevant and evaluative standards specified by the sponsoring agency in terms of:

Social Interests
Social Values
Feasibility and/or Acceptability Criteria
Concerns
Perspectives

o Social Impact evaluation relevant but not specified

Illustrative alternative modes:

- Rigorous CEA/CBA/RBA
- Loose/approximate CBA -- the normal NEPA approach recognized in judicial decisions
- Expert consensus -- Delphi, Cross-impact matrix estimates, etc.
- Limited Legal/Institutional analysis -- degree to which the controlling decision process will facilitate or constrain the authorization, implementation and operation of proposed alternative actions

  Assessment of Public Concerns in tems of the degree to which each alternative configuration will alleviate or exacerbate each of the major concerns

- Estimating the Potential Difficulty of Norm Resolution among alternatives proposed -- and other reductive tests of Public Acceptability
- Issue analysis and evaluation
- Vulnerability assessment re each alternative to the proposed action
- Design, implementation and operational errors assumed or avoided re each alternative to the proposed action
- Distributional Impact (on segments of the population) of the social gains and losses as determined by further analysis

10. ASSESSMENT OUTCOME PRESENTATION

This phase will be governed by the prior phases, particularly by the Modes of Inquiry to identify and measure the Effects and to evaluate the Social Impacts

o Types of Presentations:

- Cost Effectiveness Comparisons
- Benefit/Cost Ratio with Enumeration of the Positive and Negative Social Impacts
- Risk/Benefit Ratio with Enumeration of the Risks and Costs vs. Benefits
- Array of Benefits and Costs both Quantitative and Qualitative where rigorous analysis is not feasible
- Representation of the Assessments by Expert Opinion
- Array of Facilitators and Constraints in the Authorization, Implementation and Operational Stages pursuant to a Legal/ Institutional Assessment with respect to Alternative Actions
- Array of Alleviations and Exacerbations of Concerns registered by the Public or by Expert Assessment with respect to Alternative Actions
- Estimates of the Potential Difficulty of Norm Resolution among Proposed Alternative Actions
- Assessment pursuant to Major Issues Posed with Findings and Conclusions
- Presentation of Policy Options
- Vulnerability (potential breakdowns -- probability and magnitude) of Proposed Alternative Actions
- Array of Errors likely Avoided or of Errors Assumed in the Implementation and Operation of Proposed Alternative Actions

VI. OTA Study on Cost Effectiveness of Medical Technology

The OTA study on Cost Effectiveness of Medical Technology was selected as the sample for initial application of the Illustrative framework for evaluating a technology assessment. A sample matrix (provisional) has been forwarded with this report.

Our analysis of the report demonstrates the extent to which a "technology assessment" might deviate from this particular evaluative scheme in some respects while correlating with it in others. It also suggests that there may be various ways of handling a given assessment task all of which may result in adequate outcomes.

Selections, primarily from the Summary, were made to describe the report in Column 2 -- the characteristics of the Medical Technology assessment task. Comments on the assessment methodology are made at certain points in Column 3. The rather general nature of the task presented gave considerable leeway to OTA in devising its assessment methodology. This factor plus the manner in which OTA interpreted its task resulted in a report which would not be expected to correspond directly to many of the particular elements or operations listed in Column 1. Since the comments in Column 3 indicate certain ways in which this study shows great strength and suggest a few items which might have been better illuminated, the comments here on the Medical Technology study will be limited to general considerations of Interpretability, Warrantability, and Serviceability.

Summary Evaluation of Cost Effectiveness of Medical Technology

The relatively high level of generality with which the Medical Technology study was pitched makes it somewhat difficult to be very precise about the three criteria of Adequacy, i.e., Interpretability (clarity); Warrantability (Credibility of Performance); Serviceability (Utility of Performance to Authorizing Decision Makers and Other Parties affected by or affecting the process of implementation and operations/use of the Policy Options).

A. Interpretability: The Report is overall well written and clear.

- o However, the distinction between CEA and CBA may not be apparent to many readers upon the initial reading. It is noted though that the press reviews did pick up the main distinction made without much difficulty. [See, for example, the review in the New England Journal of Medicine, October 16, 1980.]
- o It was probably wise to treat the two techniques as a unit for purposes of this particular study.
- o The essential message of the Report seems to have come through with clarity. Consider the Greenberg statement in the Washington Post of September 9, 1980: "...OTA concluded that cost-benefit analysis and similar techniques, though useful in some circumstances, are intellectually weak tools for making health-care decisions," and further:

  > Their potential "to contribute significantly to cost containment and improved resource allocation," OTA stated, "seems to be an article of faith to many officials and health-policy experts, but both the potential significance and nature of any contributions of these techniques remain to be established.

- o The element of "cost" in health care decisions is brought to a high level of sensitivity. This is an important contribution of the Report.

B. Warrantability: Overall, the Report appears to be plausible as to reasons given for findings and thus credible.

- o The task objective -- purpose and subject matter -- are set forth in proper form though in very general terms

- The conditions of the assessment -- limitations and constraints -- do not seem to be treated very explicitly in the Report. Yet most are implicitly dealt with in some fashion. The subject matter, for example, eventually can be seen to be not merely CEA/CBA as a means to assuring greater cost accounting in the six subject programs but the various policy options which constitute the outcome of the Report.

- As noted, the generality of the task objective left many phases of the assessment process unspecified. However, certain effects to be identified were fairly explicit -- additional burden with the requirement of CEA/CBA, additional information needs, etc. And, of course, the programs to be evaluated with respect to the use of CEA/CBA were specifically identified.

- The alternatives to be assessed were not given other than the use of CEA/CBA with respect to six identified health care programs. However, the assessment was designed primarily, it would seem, to delineate policy options rather than to assess alternatives given or posited. Actually, in this type of assessment, the policy options (outcome of the assessment) were in turn assessed for consequences. That is, the policy options were the alternatives (all relating to CEA/CBA) eventually assessed by OTA. This seems to have been the appropriate way to handle the matter in view of the basic OTA mission in support of the Congress. The question arises, however, as to whether the delineation of "policy options" should not have been the start of a second phase assessment which might have been much more elaborate than that provided.

- The evolving social environment including Column 1 Phases of the assessment process (Phase 5 -- Evolving Social Environment; Phase 6 -- System of Affected Participants; Phase 7 -- Structure of Authoritative Decision for Implementing Policy Options) does not seem to have been treated in as systematic a manner as might have been desired. Nevertheless, many significant aspects of the evolving social environment were mentioned throughout the report and especially with the discussion of the policy options. These points might be made:

  - The existing "state of the art" of CEA/CBA is set forth adequately. Further, Appendix D of the Report: Values, Ethics, and CBA in Health Care is an excellent treatment of certain deficiencies in CEA/CBA.

  - A good deal is said about the "internal" processes of decision of the six designated programs under review.

  - Very little is said about the authoritative decision process through which the policy options would have to move to be implemented, either at the Federal level or the State/local levels.

    Concerns of others likely affected by the policy options were not fully or systematically treated.

- Not much of a distinction was made between near term and long term implications of the policy options although the treatment gave implicit consideration of this matter to some extent.

- Further, while the affected participants were listed, it is not clear that they were considered in an operational way of how they would affect or be affected by the policy options. No clear treatment seems to have been made between aurhoritative decision makers, other affected, and future generations -- the long term viability of society. However, implications of better cost accounting procedures vs. costs of such procedures does give some indication of the potential for conserving resources.

- Put another way, little attention was given to the interactive process of the policy options and other institutional processes of society. However, the generality of the task objective probably was not felt to require this type of in-depth analysis.

o Many of the more significant likely effects (Phase 8) of the implementation of the policy options were explicitly identified or implicitly suggested. But there does not seem to be a systematic scheme by which the range of probable effects could be identified for each policy option with respect to each program. Again, this may not have been thought necessary in view of the task objective. These points might be made with respect to both Phase 8 -- Effects and Phase 9 -- Social Impacts/Evaluative Criteria:

  - Many of the likely significant effects were identified.

  - The case studies of certain medical treatments were valuable.

    Expert opinion (including outside experts, the relevant literature, and operational personnel experience, etc.) seems to have been the technique of inquiry primarily relied upon.

  - Empirical evidence in terms of experience and development of CEA/CBA was clearly and appropriately relied upon.

    These and additional modes of inquiry are suggested in the policy options so that better ways of ascertaining likely effects will come into being in the future. Documentation, overall, was very good.

  - The uncertainties pervading certain contexts were appropriately noted.

  - Limitations on the scope of the inquiry were also noted or suggested which would constrain the scope of effects to be identified.

  - In certain sections of the Summary and the Report there is no clear distinction between Effects on the one hand and the Social Significance of such Effects on the other. But this mode of handling the task poses no serious limitation on its findings.

- If the above is correct then the absence of a scheme of evaluative criteria by which the likely effects of the policy options could be converted to social impacts (Phase 9) is of little consequence. However, such a scheme of evaluative criteria might have contributed to a more orderly and systematic appraisal of the policy options.

- Little seems to have been said about the distributional impacts of the policy options on different segments of the population, especially user-consumers.

- Special points might have been given attention: difficulty of norm resolution of the policy options; serious vulnerabilities of each policy option -- if any; and the types of errors which are assumed or avoided by each policy option.

o The statement of outcomes (per the Summary) is overall very good. The Three Principal Issues are treated in order as a basis for the Findings. The ultimate outcome -- the policy options -- is for the most part well explicated. It is likely that from among the various types of outcome presentations (Phase 10) and in view of the OTA mission in support of the Congress, that the presentation form of Findings and Policy Options was the most appropriate vis a vis the other alternatives suggested in Phase 10. These points might be made also:

- While the policy options are the inventions of the OTA staff, the treatment of each (as an alternative means of employing or not employing CEA/CBA) constituted a reassessment.

- As previously suggested, this assessment of each of the policy options could have been made against each of the phases of Column 1 (the Assessment Process -- Range of Conditions and Stock of Assessment Techniques) for purposes of treating each in a systematic and uniform manner. This, no doubt, was done but perhaps in a less orderly way than might have been ultimately feasible. However, various constraints might have argued against this procedure even if it were thought to be useful.

C. Serviceability: The Report does make a distinct contribution.

o It is probably of most utility to prospective decision makers and others in or involved with decision making in the six target programs.

o The Report would seem to have less utility to those who might be affected by decisions made pursuant to the introduction of CEA/CBA techniques into the six programs (the consumers of medical/health care).

o Little was said about the third concern structure, i.e., future generations and the long term viability of society. Perhaps it was found but not expressed that such impacts would be nominal.

- If the above is correct then the absence of a scheme of evaluative criteria by which the likely effects of the policy options could be converted to social impacts (Phase 9) is of little consequence. However, such a scheme of evaluative criteria might have contributed to a more orderly and systematic appraisal of the policy options.

- Little seems to have been said about the distributional impacts of the policy options on different segments of the population, especially user-consumers.

- Special points might have been given attention: difficulty of norm resolution of the policy options; serious vulnerabilities of each policy option -- if any; and the types of errors which are assumed or avoided by each policy option.

o The statement of outcomes (per the Summary) is overall very good. The Three Principal Issues are treated in order as a basis for the Findings. The ultimate outcome -- the policy options -- is for the most part well explicated. It is likely that from among the various types of outcome presentations (Phase 10) and in view of the OTA mission in support of the Congress, that the presentation form of Findings and Policy Options was the most appropriate vis a vis the other alternatives suggested in Phase 10. These points might be made also:

- While the policy options are the inventions of the OTA staff, the treatment of each (as an alternative means of employing or not employing CEA/CBA) constituted a reassessment.

- As previously suggested, this assessment of each of the policy options could have been made against each of the phases of Column 1 (the Assessment Process -- Range of Conditions and Stock of Assessment Techniques) for purposes of treating each in a systematic and uniform manner. This, no doubt, was done but perhaps in a less orderly way than might have been ultimately feasible. However, various constraints might have argued against this procedure even if it were thought to be useful.

C. Serviceability: The Report does make a distinct contribution.

o It is probably of most utility to prospective decision makers and others in or involved with decision making in the six target programs.

o The Report would seem to have less utility to those who might be affected by decisions made pursuant to the introduction of CEA/CBA techniques into the six programs (the consumers of medical/health care).

o Little was said about the third concern structure, i.e., future generations and the long term viability of society. Perhaps it was found but not expressed that such impacts would be nominal.

- Among the contributions the following appear to be of most importance:

  - Sensitizing all concerned with the "cost" dimension of health care procedures.

  - Distinguishing among programs and types of health care decisions in terms of those offering incentives to institute or attempt cost containment through CEA/CBA and those which do not or which present overriding ethical or political issues reducing the likely usefulness of CEA/CBA.

  - Providing policy options and setting out -- to some extent -- the pros and cons of taking such alternative actions.

  - Taking a cautious "middle" view of the prospects for CEA/CBA to contribute to improved cost containment procedures.

    Establishing the basic conditions under which future CEA/CBA actions should be taken. That is, the message seems to be: <u>Proceed with caution and with modest expectations.</u>

  - Emphasizing again the difficulty of making/treating "benefits" when using the CBA technique.

- Overall, the serviceability of the Report goes basically to that of providing a guide to future action. In view of prior comments, any one of the policy options (or others) which might be considered should be subjected to a thorough reassessment as a means of informing the three user groups of the full spectrum of concerns and how such concerns might be affected by the implementation of the proposed action. Such reassessment might be performed in terms of a procedural program of action using a legal/institutional analysis.

VII. OTA East-West Trade Study

A. Matrix Analysis

The OTA study Technology and East-West Trade was made in response to a request from the House Committee on Foreign Affairs and the Senate Committee on Commerce, Science and Transportation.

It addresses the "costs and benefits of the United States' selling technology to and expanding its commercial relations with the Soviet Union, Eastern Europe, and the People's Republic of China." (p. 3) The report discusses the economic, political, and military and strategic issues involved in East-West trade and technology transfer and explores three policy options available to the United States.

Although the report is not a technology assessment at all, it lends itself fairly well to assessment using the matrix. This is because there are alternatives to be considered (the policy options) and an important institutional context (the national and international arenas in which decisions must be made).

1. Task objective

As stated in the report:

purpose

"to examine the economic and national security implications of the transfer of technology between the United States and the Communist world." p. iii

"to help provide Congress with the capability to address the complex issues raised by this trade, including the extent to which international trade in high technology endangers the national security of the United States." p. 3

"it is the goal of this assessment to...provid[e] material that will allow a better analysis of the kinds of military, political, and economic costs and benefits that any program affecting East-West trade and technology transfer is likely to incur." p. 4

This is done by examining three policy options available to the U.S.--these are alternative actions, but not alternative actions to achieve one social goal. Each option depends upon a different perspective or view of the world as to what values are important.

subject matter

"The study identifies and, where possible, evaluates the economic, political, and military costs and benefits that accrue to the United States in its trade with the Soviet Union, Eastern Europe, and the People's Republic of China, taking account of the complex ways in which these factors interrelate. It sets forth a spectrum of policy options which could potentially affect these relationships, and explains the difficulties in projecting their consequences.

"The report also provides background information on the functioning and the implications of U.S. trade policy vis-a-vis the Communist world, including the areas of tariff and credit policy and export control, both in the United States and in selected allied nations. Finally, it surveys the past and potential contributions of Western technology to the economies of the Soviet Union and China." p. iii

It does this, and does it well, in a clear and understandable manner.

2. Conditions of the Assessment

There is very little information in the report concerning these aspects.

See p. 3: "This subject is complicated by both conceptual problems and disagreements about the nature and future of U.S.-Soviet relations. The conceptual problems concern the difficult task of defining and measuring technology. These problems are dealt with in Chapter VI. The disagreements are manifested in the divisiveness and ambivalence which surround the question of the appropriate nature and extent of U.S. trade with the East. At the center of these disagreements seems to lie an even more fundamental difference of views about the basic strategies that the United States should employ in its dealings with the Communist world."

Chapter VI deals with definitions and problems of measurement.

There are also other references to lack of data (e.g. p. 53) and difficulty of assessment: "In light of this, assessment of the impact of East-West technology transfer on the U.S. economy must be limited to narrowly defined generalizations." p. 54

3. Degree of Specification of Task

Specified in only general terms. See Purpose under Phase 1, supra. The study performance fully elaborates the two areas of alternatives and social environment. This seems logical for this sort of report, which is not a TA, but a policy assessment.

4. Alternatives -- Project Configurations

The alternatives are the three policy options--

> "each rests on a basic orientation toward the Communist world and set of beliefs and expectations regarding America's future relations with it." p. 13

These policy options (and suggested specific actions pursuant to each) were developed by OTA. They were not posited by the task-objective.

Present U.S. policy is defined as a decision to forego economic warfare and further the dual aims of encouraging trade and protecting U.S. security.

a) The first alternative is actions in keeping with existing policy but designed to make procedures more efficient.

b) The second alternative is actions to increase restrictions or strengthen the use of trade as a foreign policy lever.

c) The third alternative is actions to expand East-West trade.

Each of these has all the components of a project-configuration except for the technological system--all the institutional arrangements are relevant.

5. Evolving Social Environment

The social context interactions -- here mainly international, although also domestic factors to some extent -- are very important to the subject and are dealt with in detail. The international situation is treated more fully than the domestic--with reason, but perhaps more could have been said about U.S. institutions and actors.

-- the time period is indefinite and not specified, but the report talks of near, mid, and long term implications

-- the geographic area is posited by the subject matter

-- the jurisdictional dimensions at the national and international level are treated at length -- the private sector is not

-- relevant factors and trends: international and national decision processes, technological innovation, economic resource allocation, knowledge and skill capabilities--these are dealt with fully, as they are the most relevant factors affecting the policy analysis

Specifically:

Chapter III describes the economic context, including present U.S. share in trade, factors influencing trade, the role of technology, etc. (pp. 35-53), and concludes: "In the last analysis, deliberate policies in both the East and West may be hostage to larger economic conditions." p. 49

Chapter VII is another important description of context/evolving social environment--it describes the conditions under which U.S. East-West trade policy evolved and the changes that have taken place in response to various factors. It then discusses three areas of U.S. policy with the most potential for influencing East-West trade:

1) export license controls
2) credit and incentive controls--Eximbank and CCC
3) tariffs, especially MFN issues

Chapter VIII on CoCom and Chapter IX on the East-West trade policy of US allies are devoted to a description of the environment in which US policy operates. Chapters X and XI on the USSR and the PRC do the same.

6. System of Affected Participants

--The relevant decision makers are multiple and international in scope--an important point in the context of what the U.S. can or cannot do.

--Others affecting the process are allies and Eastern nations themselves, thus many factors are involved. See Chapters 8-11 for discussion of international actors and pp. 55-63 for domestic ones.

--Those affected are all participants in the process, but this topic is little addressed. See pp. 55-63 for discussion of US private sector participants: vendors of technology (US corporations)
import competitive industries
importers of Eastern technology ("reverse technology transfer")
US consumers

--future generations: the topic is not addressed, and since the implications of any option chosen with regard to technology transfer and East-West trade will affect future generations, this is an important concern.

7. Relevant Structure of Decision

arenas -- gone into in some detail for all aspects: US, allies, USSR & PRC--Chapters 7-11.

process -- this aspect is dealt with also as regards all the areas--in Chapters 7-11.

As regards US policy:

"The product of years of incremental modification, this system embraces a cumbersome and sometimes confusing set of procedures that reflect diverse and frequently conflicting interests." p. 111

This is not a concerns approach, but the concerns or interests of U.S. policy makers and other domestic stakeholders, as well as those of US allies and the USSR and PRC seem to be stressed and greatly affect the prospect for norm resolution.

8. Effects Identification and Measurement

The consensus seems to be that US actions under any alternative policy option will have a limited effect on the volume of East-West trade, but each measure proposed is examined with regard to the effect it might have. See Chapter I, pp. 13-15. This is done through a combination of expert opinion and analogy from past experience. In Chapter V--Military Implications--the concept of military risk is discussed and two approaches examined: case-by-case (pp. 88-91) and critical technologies (pp. 92-95).

9. Social Impact Evaluation

One of the purposes of the report is to examine the likelihood of value promotion by using the different alternatives--i.e., whether US policy on technology transfer can be used as leverage to influence Soviet policies. See especially Chapter IV--Foreign Policy Implications--which discusses the three perspectives on the political uses of trade:

1) Trade is not an effective instrument to achieve political objectives (most US allies feel this way). The OTA study points out, however, an important asymmetry in economic transactions between pluralist and centralist economic systems: "A particular business deal may well be to the net advantage of a specific American company, but to the net disadvantage of the United States relative to the U.S.S.R." p. 68 Also, the United States as a superpower must unavoidably try to influence Soviet policy, whereas a nonsuperpower does not.

2) Trade can have political consequences and utility and can be a moderating influence (idea of detente). But, as OTA points out, there is a "theoretical tension" between the notion of a web of cooperation and using the same transactions to coerce policy. p. 71

3) Trade can have political consequences but no detente is really possible, thus trade strengthens the adversary.

The chapter compares the perspectives, examines the case of US influence on Soviet emigration policy, and two cases of technology transfer. These two are oil and gas drilling equipment and computers, which are seen as the most plausible for use as political leverage, since they are seen as the technologies most wanted by the USSR. The conclusion is that "there is no 'magic' technology as far as political leverage is concerned." p. 82

10. Assessment Outcome Presentation

Although the report states that it will examine the "costs and benefits" (p. 3) of US technology transfer and trade with Communist countries, the presentation is more in the nature of an assessment of major issues.

Chapter I, the summary, treats these issues under headings of economic, political, military and strategic, and America's allies. The bulk of the report gives the background data and analysis of these issues in more detail.

Then the three policy options (each resting "on a basic orientation toward the Communist world and a set of beliefs and expectations regarding America's future relations with it" p. 13) are examined. "Suggestions" (pp. 13-15) are listed in the summary and discussed at length in Chapter VII. The report does identify those measures OTA feels would contribute most to achieving the goals of each option.

B. Summary Evaluation

- The three perspectives outlined are crucial to this report in that they tend to shape the ultimate alternatives (policy options) and provide the scheme of evaluative criteria for determining benefits and costs/risks. S 3-5

- The complexity of tracing through effects is noted along with the vast uncertainties. S-4

- The basic analysis involves the discussion of Issues and Findings. Economic Issues emphasizes current conditions (barriers to trade and the importance of Western technology to the economies of the importing countries), the prospects for future trade (the evolving social environment), and potential detrimental effects on the U.S. from sale of advanced technology. Other effects and certain benefits are also noted. S 5-10

- Discussion of the Political Issues goes to positions which have been taken and which reflect variations on the three basic perspectives. It is noted that the evidence is inconclusive re the utility of trade leverage in East-West relations. It is of interest here how an issue discussion may describe or suggest conditions and trends, alternative actions, possible effects and the resulting advantages or disadvantages depending upon one's perspective. S 10-11

- The Military and Strategic Issues discussion finds that "A conclusive determination is probably impossible." It is stated that any judgments with respect to this issue are "based on informed speculation." S-11. The large area of disagreement on the extent to which American technology has contributed to Soviet military capabilities is emphasized. It is stated that such disagreement has its source in the divergent perceptions of "Soviet capabilities and basic intentions,..." S-12

- It is also noted that the impact of CoCom is in large part based upon "anecdotal evidence." S-12

- An interesting observation is made on future conditions in the statement that "the United States may be able to initiate and maintain a strong unified Western bloc position on the transfer of technology." S-13

- The Policy Options are arranged in three categories corresponding to the three basic perspectives noted above. The first option category goes to actions consistent with existing policy (previously described at S-13) but designed to improve the effectiveness and efficiency of current procedures. Here suggestions (action alternatives) are made of ways in which the export-licensing system might be made more effective. This seems to be an essentially legal/institutional focus directed to removing barriers to more efficient procedures and, hence, an advantage. S-14

- The second option category suggests alternatives for using foreign trade as a "Policy Lever." It is noted that the effects (and effectiveness) of these suggestions are problematic. This is another way of saying that the effects of such actions may be difficult to trace and/or that the benefits and costs of the effects, if identified, may be ambiguous. An interesting aspect of this option evaluation is the use of "contingency" inquiry with respect to the strengthening of CoCom: "Such changes might be possible only if the United States itself embarked on a new and clearly confrontational policy vis-a-vis the Communist world." S-14

- The third option suggests actions designed to expand East-West trade. The effect of one alternative is expressed: "Here, providing access to official export financing is probably the Government policy with the highest potential for increasing the volume of U.S. trade with the East." S-15. Obviously this is a benefit from the perspective of those favoring increased trade but not by those who consider trade in technology a threat to the U.S. by contributing to the strength of Communist economies. Some effort is made to distinguish between feasibility of alternative actions and the degree of acceptability of such actions.

- In summary, the <u>adequacy</u> of performance of this study might be stated as follows:

  - The form and expression of the report are very good. It is an orderly presentation and it is for the most part understandable. The treatment of context is especially well done.

  - The warrantability of the study seems quite satisfactory. For example, disclosure is made of assumptions, uncertainties, and disagreements. Explaining that certain findings and estimates of effects of applying rationales reflecting the three basic perspectives rest upon rather weak evidence contributes to the warrantability of the study from the standpoint of OTA performance. However, the uncertainty surrounding much of the discussion of issues as well as the uncertainty of effects of particular option actions cautions Congress against heavy reliance on the probable impact of any given action.

  - It is felt, nevertheless, that the report should have been highly serviceable to the Congress in that the many variables in this complex problem area were identified and clarified. A report of this quality surely can contribute to more knowledgeable decision making. But how far it has done so or can be expected to do so is problematic. The report would have to encourage the users to re-examine their positions on whichever of the three basic perspectives they currently embrace.

VIII. OTA Study on Environmental Contaminants in Food

Environmental Contaminants in Food was done at the request of the House Committee on Interstate and Foreign Commerce. This assessment "examines the adequacy of current Federal and State efforts to deal with the environmental contamination of food" which is the result of "human activities as agriculture, mining, industrial operations, or energy production". Contaminants inadvertently enter the food supply and are not intended.

This assessment looks at the magnitude of the problem, the regulations and monitoring efforts to detect and respond to such incidents, and the likelihood of future incidents. Given the uncertainties characterized in this report regarding the scope and magnitude of the problem, its focus on current abilities to regulate and monitor contaminants is also directed towards the problems of detecting unsuspected contaminants and anticipating future incidents.

What follows is an analysis of Environmental Contaminants in Food by the matrix. In addition, an analysis by the Concerns Approach is given with examples of the application of the dimensions of significance and the generic reliability conditions to two concerns.

1. Assessment Task-Objective

   o Purpose: Environmental Contaminants in Food focuses on the adequacy and effectiveness of existing policies to regulate and monitor such incidents.

   "This assessment examines the adequacy of current Federal and State efforts to deal with the environmental contamination of food. In particular, the study evaluates the effectiveness of 1) Federal and State monitoring systems in detecting contamination episodes before they reach crisis proportions, and 2) Federal efforts to regulate contaminations." p.3

   o Subject Matter: Environmental contamination of foods comes about in two ways--through long-term low-level diffusion of chemicals in the environment and from industrial accidents or waste disposal resulting in higher-level, shorter-term releases. These contaminants include organic chemicals, metals and their complexes, and radionuclides.

   "Our regulatory monitoring system has failed to detect such environmental contaminants as they entered the food supply. Thus, this assessment identifies and evaluates other approaches for monitoring either food or the environment for toxic substances that may harm human health." p.5

   "This assessment has focused on two central problems: regulating environmental contaminants and identifying environmental contaminants." p.6

2. Conditions of the Assessment:

There are many constraints and limitations on the study. These fall into the following categories:

-scope of assessment
-informational constraints

o Scope of assessment

Incidental additives are not considered contaminants. "Other chemicals may enter food as a result of their use in food production, handling or processing. Such substances may be legally permitted if they are unavoidable under good manufacturing practices and if the amounts involved are considered safe." p.15

"Only those environmental contaminants introduced into food as a result of human activities such as agriculture, mining, and industry are considered in this assessment." p.15

o Informational constraints

--Magnitude of the problem--

"There is little information available on the number of food contamination incidents, the amount and costs of food lost through regulating actions, or the effects of consumption of contaminated food on health. To obtain information on the extent of the problem, OTA reviewed the literature and sought information from the States and Federal agencies." p.19

"Questionnnaires were mailed to the Commissioners of Health in each of the 50 States and the District of Columbia as well as the Federal Agencies [to report the number of incidents of environmental contamination of food that resulted in regulatory action for 1969-78.] This survey has limitations. Some States did not answer all questions. The questions were subject to interpretation and misunderstanding... [While not complete or comprehensive information, this data is] the first to be developed on the extent of environmental contamination of food." p.23

"The number of food contamination incidents reported to OTA does not represent the total number that has occurred in the United States, only those in which the Federal Government and 18 State governments have taken regulatory action. Many incidents never come to the attention of State or Federal authorities." p.23

--Availability of data--

OTA could rely on no central data source and at times, no data at all.

"Data presented here indicate that environmental contamination of food is a nationwide problem of unknown magnitude. Long-term, low-level exposure to toxic substances in food poses health risks that are difficult to evaluate given present techniques.... However, regulatory

actions have been taken to restrict consumption of contaminated food in cases where potential health risks were considered unacceptable." p.29

In assessing the likelihood of future contamination incidents found in Appendix A, "Substances Whose Production or Environmental Release Are Likely to Increase in the Next Ten Years", limitations of present knowledge are stated:

"During the development of the approach to this phase of the project, certain problems and limitations became apparent. The nature of chemical substances under research and development but not yet introduced to the market is usually closely guarded proprietary information and therefore not available. In addition, there are no data systems which bring together chemical information to facilitate the retrieval of necessary data. An approach was developed to obtain a maximum amount of information in a limited amount of time." p.119

--Economic Impact--

"USDA's Food Safety and Quality Service reported food condemnation cost estimates. These estimates, however, only cover livestock and poultry...FDA, which has regulatory authority over the remaining food commodities, did not estimate costs for reported environmental contamination incidents (70 percent of the Federal total). Thus a significant proportion of the total costs for environmental contamination incidents requiring Federal action is unknown." p.26

--Economic Impact cont.--

Extrapolation from the number of reported incidents with general cost estimates yields a rough picture of the economic impact. "The true cost would be impossible to estimate from this limited sample." p.26

"Health costs are not available for previous U.S. food contamination incidents." p.27

3. Degree of Specification of Task

The task given to OTA was to examine "the adequacy of current Federal and State efforts to deal with the environmental contamination of food." p. 3

Within this very general framework, OTA focused on the following:

- o The relevant decision processes are the major focus of attention. First the report analyzes methods and procedures for identifying and regulating environmental contaminants. It examines the nature of the problem -- scientific limitations, State-Federal interactions (institutional limitations), limitations in methods used by the decision process for establishing regulations (e.g. cost/benefit, cost effectiveness).

- o In describing the extent/magnitude of the problem, the uncertainties and unknowns are prominent characteristics of environmental contamination in food. Given such unknowns, efforts were directed towards information gathering rather than assimilating already known data.

- o The evolving social environment is placed within the context of the current identification of the problem of hazardous wastes and their potential migrations.

- o Outcomes are directed towards institutional modifications to rationalize the process of standard setting given uncertainties. For example, Congress could clarify the role economic criteria have in standard setting. An anticipatory capability and a response capability are recommended which would minimize uncertainties, draw on experience and coordinate efforst in anticipatory/response efforts.

4. Alternatives - Project Configurations

OTA presents three policy options in addition to the status quo as alternatives to addressing the inadequacies of current policies.

o Institutional Process

--Alternative as prescribed in Policy Option 3 to Establish an Investigatory Monitoring System--

"Environmental contaminants could be detected earlier in the food chain by improving present environmental monitoring capabilities - establishing an investigatory monitoring system while maintaining current regulatory monitoring programs." p. 112

o Formal Authority

--Policy Option 2 to Amend the Food, Drug and Cosmetic Act--

"Congress could choose to give regulatory agencies more guidance by clarifying its position on environmental contaminants in food." p. 110

ways to do this: simplify administrative procedures
require the establishment of tolerances
clarify the role of economic criteria
establish regional tolerances

o Essential Supporting Institutional Structure

--Policy Option 4 to Improve Federal Response to New Contamination Incidents--

"To cut down on confusion and to improve delivery of Federal technical assistance, Congress could choose to designate a lead agency or establish a center for the collection and analysis of data." p. 113

5. Evolving Social Environment

The context of the problem of environmental contaminants is presented along with the potential future societal context and potential problems.

> "The environmental contamination of food is a result of our modern, high-technology society. We produce and consume large volumes of a wide variety of substances, some of which are toxic." p. 15

> "Because a limited number of substances posing health problems already have been identified in food, concern exists that other toxic substances are likely to contaminate food in the future." p. 29

The report does not, however, treat the social context issues as fully as it might have done. Its emphasis is more on the identification and analysis of current decision processes surrounding environmental contaminants in food than its evolving context and value positions. There is some treatment of these issues in the following areas:

- o public decision process -- In Federal and State programs, there are gaps and inadequacies due to no coordination or centralized agencies.
- o knowledge and skill capabilities -- the report addresses the limitations of testing methods which serve as a data base for regulation setting.

> "The prospects for developing a human epidemiological method that would meet such regulatory demands [given the limited time allowed] are presently hard to imagine." p. 61

> "The key consideration is whether present testing technologies are adequate to provide data that are useful in making regulatory decisions." p. 66

> According to the OTA report, this is a major area of uncertainty at both the Federal and State levels.

6. Systems of Affected Participants

o Institutional Actors.

Relevant decision-making institutions include the Food and Drug Administration, U.S. Department of Agriculture's Food Safety and Quality Service, and the Environmental Protection Agency. Regularized procedures for monitoring and regulating foods falls under FDA and USDA. p.35

As an environmental contamination incident originates within a state, there are usually two state agencies which are involved, Departments of Health and Agriculture.

"Many environmental contamination incidents are initially State problems... Given the complexity of this country's food-marketing system, most food produced or processed within a particular State is distributed for consumption in other States [and therefore of Federal concern].

"The generation and dissemination of scientific information on an incident is hindered by the number of State and Federal agencies involved. As already noted, three Federal agencies, each with different responsibilities, can be involved along with various State agencies." p.52

o Others Affected

"Distributional Effects and Costs involve the various people, groups and organizations who are economically affected by an environmental contamination incident." p.27-8

These are identified as:

Producers - these are usually the exposed ones as well
Firms Held Accountable for Environmental Contamination
Governments - Federal, State, and local
Consumers - as affected by health and by the price of goods
Indirect - for example, a food processor needing a new source of supply

o Future Generations

The concerns of future generations are not dealt with in any great detail, except to note that Federal and State programs to "regulate or control food safety problems...usually are not funded to handle the kind of long-term problems created by a PBB or kepone incident." p. 28

7. Relevant Structure of Authoritative and Controlling Decisions

The bulk of the report is an in depth analysis of the methods for setting regulations, procedures for controlling environmental contamination in food, and an analysis of Federal monitoring programs. The Federal agencies with regulatory authority over environmental contaminants in food; FDA, USDA, and EPA are those arenas in which the standards and procedures are established.

Congress enacts the legislation governing these bodies. Therefore, OTA proposes to the Congress alternative structures to resolve the problems associated with monitoring and regulating environmental contaminants in food identified in the assessment.

States vary in their responsibility for food regulation and in degree of coordination with the Federal government:

> Basic State food and drug statutes are based on the Federal food laws; however, not all states have adopted the model uniform State food, drug, and cosmetic bill of the Association of Food and Drug Officials. p. 49

8. Effects Identification and Measurement

Effects identification is elaborated to the extent that a comprehensive picture of the problem of environmental contamination in food is detailed. The uncertainties in fully defining the extent of the problem are presented. Distributional effects are not emphasized and effects are not measured in terms of probability and magnitude because of uncertainties. The aim in describing these effects is "not to identify all the distributional costs but rather to demonstrate the variety of effects and costs that can result from an incident." p.27

What the report has done well is to analyze the complex interactions involved in the procedures and processes of identifying and regulating contaminants. This comprises the major thrust of the assessment. It is a comprehensive single-source document to look at the problem for the first time.

9. Social Impact Evaluation

- o In assessing health risks and costs in order to set regulations for environmental contaminants, value questions are raised.

  "The primary issue involved in assessing health risks is not whether the potential risks from an environmental contaminant should be evaluated for purposes of regulation but rather what testing methods are most appropriate for assessing potential risks.
  The situation is reversed, however, when the associated costs of an action level or tolerance for an environmental contaminant are assessed. The primary issue is whether the costs should be taken into account in the setting of a tolerance or action level." p.73

- o The underlying value is to minimize, if not eliminate, the likelihood of environmental contaminants inadvertently entering the food supply and affecting public health.

  "Monitoring involves the systematic collection and chemical analysis of food samples from the environment. The aim is to protect consumers by determining short- and long-term trends in the levels of various chemicals in food and the environment." p.81

- o Impacts are uncertain because of the uncertainties stated in the report:
  - unknown incidents
  - long term health impacts

The report does not evaluate impacts. The emphasis is on first identifying effects and then describing the decision process monitoring environmental contamination of food.

10. Assessment Outcome Presentation

The outcome of this assessment is presented in terms of Policy Options to the Congress. These three options in addition to maintaining the status quo are presented in terms of the benefits and risks of each. While the 3 options are not mutually exclusive, various configurations are not presented. These options are:

--Amend the Food, Drug and Cosmetic Act
--Establish an Investigatory Monitoring System
--Improve Federal Response to New Contamination Incidents

After summarizing economic impacts, health impacts, major problems in identifying environmental contaminants, and problems of regulating environmental contaminants, findings and conclusions are presented. These go to the adequacy of current regulatory procedures to resolve problems such as anticipating contaminants, relative weights to be given various criteria in setting regulations, and managing environmental contamination incidents.

ANALYSIS OF ENVIRONMENTAL CONTAMINANTS IN FOOD BY THE CONCERNS APPROACH

A. Critique of OTA's Environmental Contaminants in Food

Identifying the scope and magnitude of the problem of chemicals, metals, and radionucleides inadvertently entering the food supply is laden with uncertainties. Analytical capabilities depend upon the data available to assess a problem and thereby determining the range of analysis. From the outset, Environmental Contaminants in Food presents the unknowns and uncertainties, i.e., conditions of the assessment, and therefore, the limitations on available information and data.

There is a trade-off that must be made between the degree of constraints on the information available and the depth of assessing social impacts. Determining impacts (values affected and issues therein) depends upon the adequate identification of effects (facts). OTA efforts were directed towards information gathering to reduce the unknowns and uncertainties of the magnitude of the problem and the scientific limitations.

How can one assess impacts if the characterization of the present problem is laden with uncertainties and constraints? First OTA had to address these limits of knowledge. For this reason, the report is short on assessing social impacts. It does not present the full range of concerns and issues in a clear manner that are or will be of significance to society. More specifically, concerns surrounding environmental contaminants in food present a range of different issues now and in the future. OTA does not probe those areas that are likely to present continuing or new challenges to the decision process.

The subject matter lends itself to an analysis by the concerns approach (the dimensions of signficance and the generic reliability

conditions). First by systematically categorizing the issues into concerns, resolution of the unknowns and uncertainties can be addressed based on the identification of the appropriate forums and arenas. Next, concerns that may emerge and present public policy issues could be identified as well as the range of values, i.e., significance. The following is a brief characterization by concerns of environmental contaminants in food and examples of the application of the two analytical methods--dimensions of significance and generic reliability conditions--to these concerns.

B. Concerns Surrounding Environmental Contaminants in Food

Environmental contaminants in food result from the operations of technological systems, i.e., agriculture, mining, and industry.

PROBLEMS WITH OPERATIONS --	o Accidents involving contaminants which enter the food supply with higher level contamination o Higher level contamination from waste disposal o Low-level contamination from gradual diffusion of persistent chemicals through the environment
MISUSE OF FACILITIES -- OR MATERIALS	o Sabotage for deliberate contamination of food within a facility o Diversion of foods in transit for contamination o Diversion of toxic wastes for contamination (or other than intended disposal)

DECISION PROCESS --

- o Integrity and Competence
  - -regulatory system and laws capable of detecting and responding to incidents efficiently and effectively
- o Costs of Environmental Contaminants
  - -economic impacts
  - -health impacts
  - -scientific testing and instrumentation
- o Distribution of Costs, Risks, and Benefits
  - -risks may not be equitiably distributed based on regional variations in exposures and those affected economically
- o Individual Rights
  - -potential infringement of rights in job opportunities if characterized by identification of their exposure to environmental contaminants

LONG-TERM EFFECTS --

- o Economic Viability
  - -minimizing future contamination incidents as they affect agriculture, mining, industry
- o Future Generations
  - -long-term health impacts from contamination

DIMENSIONS OF SIGNIFICANCE:

The dimensions of significance can be applied to the analysis of concerns. Here is a picture of how that could be applied to concerns surrounding environmental contaminants in food.

CONCERN -- Low-Level Contamination

1. Scope and Intensity

   With the identification of 1200-2000 hazardous waste sites, the potential for low-level longer-terms insults to various populations exists. Scope could be widespread. Intensity could be very high, e.g. note the emotional intensity at Love Canal.

2. Expert Agreement on Risks and Controls

The uncertainties of the toxicity of chemicals and of detecting their presence in the environment could be analyzed.

Abilities to control inadvertent contamination and areas of agreement/disagreement would be analyzed.

3. Association with Environmental Contaminants

Uniqueness or the presence of analogous situations.

4. Potential for Rapid or Gradual Change

The realization of the risks from low-level gradual diffusion of chemicals in the environment will come about in time. Thus, the likelihood for gradual change is very great.

Scientific understanding of some of the uncertainties regarding low-level contaminants, carcinogenicity, and toxicology are likely to result in changes.

5. Relative Priority

Concern surrounding the low-level contamination of the environment and ultimately the food supply triggers other concerns. For example, It could exacerbate concern for the competence of our institutions to effectively respond to situations and raise fears over the unknown risks.

6. Amenability to Resolution

Arenas for addressing the issues inherent in this concern are those agencies charged with the responsibility to protect the public. In setting standards, FDA and USDA (mainly) could address the uncertainities and unknowns to expand the limited knowledge base which contribute to understanding the risks and controls.

GENERIC RELIABILITY CONDITIONS:

Without going through all 24 conditions (See attached chart from Public Concerns and Alternative Nuclear Power Systems. GWU), these concerns could be analyzed according to these critieria. This is particularly applicable to the problem of environmental contaminants in food because it is a risk situation. The reliability conditions address those conditions which should be met in order that the likelihood of risk realization is minimized.

CONCERN -- Higher-level contamination from waste disposal

Examples of Reliability Conditions:

- o 1.1.1 Are the causes traceable vs. undetectable?
- o 1.2.4 Have either consequences or risks ever exceeded expectations vs. frequent and major surprises?
- o 2.2.1 Are the risks avoidable because there are alternatives vs. being associated with essential activities?
- o 3.1.2 Is the response quick enough to halt the causal sequence vs. too late to be effective?
- o 3.1.4 Are the consequences felt immediately vs. being delayed and/or lingering?

Table B-5. THE 24 GENERIC RELIABILITY CONDITIONS

GENERIC RELIABILITY STRATEGY	COURSE OF RISK REALIZATION			
	..1 Initiating Cause	..2 Causal Sequence	..3 Risk Consequences	..4 EVALUATION of Consequences or of Risks
INFORMATIONAL STRATEGIES 1.1. Improve Knowledge of Risk 1.2. Improve Knowledge of Control	1.1.1 Are the Causes Traceable vs. Undetectable? 1.2.1 Is the Process of Designing, Testing, and Reviewing Done Carefully vs. Being Hit or Miss?	1.1.2 Is There Widespread Experience with Causal Sequence vs. Little or No Experience? 1.2.2 Are the Sensitive Points of Control Known and Monitored vs. Poorly Used?	1.1.3 Are the Consequences Certain to Follow from the Causes vs. Obscure or Equivocal? 1.2.3 Can the Consequences Be Traced and Diagnosed to Improve the Controls vs. They Are Unknown to Experts?	1.1.4 Are There Precedents for Societal Norms vs. Few or None? 1.2.4 Have Either Consequences or Risks Ever Exceeded Expectations vs. Frequent and Major Surprises?
SPATIAL STRATEGIES 2.1. Assure Dependable Elements 2.2. Provide Redundant Elements	2.1.1 Is the Exposure to Risk Voluntary and Discretionary vs. Involuntary or Mandatory? 2.2.1 Are the Risks Avoidable Because There Are Alternatives vs. Being Associated with Essential Activities?	2.1.2 Is the System Simple and Made Up of Dependable Functions vs. Complex with Undependable Functions? 2.2.2 Are There Redundant Alternatives for Each Essential Yet Undependable Element of the System vs. No Backup?	2.1.3 Can the Consequences of the Risk Be Bounded vs. Being Open Ended? 2.2.3 Are the Consequences from Each Risk Isolatable vs. Having the Whole System at Stake?	2.1.4 Are the Risks Common and Generally Accepted vs. Dreaded and Unacceptable? 2.2.4 Do the Consequences Affect Only a Few and Arouse Only a Few Parties vs. Presenting Severe Barriers to Compromise?
TEMPORAL STRATEGIES 3.1. Respond in a Timely Fashion 3.2. Delay the Need to Respond	3.1.1 Are the Responses to Causes of Risk Proportional, Gradual, and Incremental vs. Sudden and Threshold Dependent? 3.2.1 Are the Causes of Risk Anticipatable Well in Advance vs. Unknown Timing?	3.1.2 Is the Response Quick Enough to Halt the Causal Sequence vs. Too Late to Be Effective? 3.2.2 Can the Causal Sequence Be Delayed Until Controls Are Either Devised or Not Needed vs. It Cannot?	3.1.3 Are the Consequences Chronic vs. Catastrophic and Infrequent? 3.2.3 Are the Consequences Reversible vs. Irreversible?	3.1.4 Are the Consequences Felt Immediately vs. Being Delayed and/or Lingering? 3.2.4 Is the Importance of the Consequences Invariant vs. Dependent Upon the Timeframe In Which They Occur?

COMMENTS

The approach presented here could provide a deeper analysis of concerns surrounding environmental contamination in food and a clearer picture of the many issues the problem embodies. Environmental Contaminants in Food addresses public concerns in this manner:

> The major environmental contamination incidents that occurred in Idaho and Michigan continue to be major issues of concern among the residents of these States--a result of their fears over a potential health threat that cannot be seen, smelled, or tasted. In Michigan, for instance, the PBB episode remains a live and controversial political issue. Consequently, it becomes imperative that the information generated by the State and/or Federal Government on an incident is accurate and appropriately applied. This objective is hindered by the variety of State and Federal agencies that become involved. p.55

The concerns approach would yield a categorization of the various concerns implied within the above paragraph. It is not just the generation of accurate information which will resolve the concerns of the public. Furthermore, arenas for resolution could be more fully explicated in order that all concerns and issues are addressed. Additionally, the likelihood that changes in knowledge, information, experience and other social variables will bring about changes in concerns can be evaluated by the dimensions of significance. Addressing the conditions to minimize the realization of the risks could also be further elaborated by the analysis of concerns according to the the generic reliability conditions.

SUMMARY

The adequacy of performance can be presented as follows:

A. Interpretability: the report is overall well written and clear

Given the complex nature of the problem, OTA presented the many aspects of the decision process with a high degree of clarity. The essential message of the report seems to have come through. The press has reported OTA's efforts in the following manner:

> The current unknowns are many indeed, according to OTA. Much information is missing about all the pollutants, their identities and threats to specific foods; the nature and extent of each contaminant's effects on human health and the economy; the costs of learning all that and then instituting regulations; and comparisons between the costs and benefits. (Goody L. Solomon, "Contaminants in Our Food". Air Force Times. Jan. 28, 1980).

OTA's major contribution is in assessing the state-of-the-art in detecting environmental contaminants and the uncertainties of determining the extent and magnitude of the problem (technical and institutional).

B. Warrantability: Overall, based on the OTA report, their findings, conclusions and recommendations are justified.

OTA stated the uncertainties and unknowns from the outset. Given these, the efforts expended were directed towards determining the extent of the problem; the nature of institutional relationships; the scientific uncertainties involved in setting standards; and the methods of decision-making. Its credibility as a document is particularly strong in addressing the complexity of environmental contaminants in a comprehensive manner.

C. Serviceability:

As a comprehensive document, this report seems highly serviceable to the Congress. Policy Options presented address the institutional needs identified in the report which require legislative directive. It certainly contributes to informing decision-makers as to the institutional needs in reducing the gaps which exacerbate the problem.

OTA's report is useful to more than the Congress. As a document which characterizes the decision process surrounding environmental contaminants and scientific questions involved in regulation setting and enforcement, it serves as a source in looking at the broader question of regulations given scientific uncertainity and priority setting. It provides a comprehensive picture of one aspect of risks and modern society from which to increase understanding and learning and, thus, rationalize decisions.

In addressing the problem of identifying suspected contaminants, it points out the problems of contamination occuring from unsuspected sources. This is identified as a long-term need to be able to anticipate incidents from the universe of possible contaminants. This is not a problem easily resolved and one likely to present problems to future generations. The utility of OTA's report to future generations is based on their recommendation for Federal investigatory monitoring programs and building information sources upon which to make decisions.

IX. Energy From Biological Processes

A. Matrix Analysis

This assessment of Energy From Biological Processes "responds to a request by the Senate Committee on Commerce, Science, and Transportation for an evaluation of the energy potential of various sources of plant and animal matter (biomass)." p. iii

The report analyzes the technical, economic, environmental, and social issues surrounding four biomass fuel cycles -- wood, alcohol fuels, herbage, and animal wastes -- and reaches conclusions about the potential of biomass fuels to replace conventional fuels by the year 2000. It also discusses policy options for promoting energy from biomass.

1. Assessment Task-Objective (T-O)

o Purpose

The purpose of the study is only vaguely stated as "an evaluation of the energy potential of various sources of plant and animal matter (biomass)." p. iii From the organization and presentation, however, it becomes clear that OTA interpreted the request from the Committee broadly (see below).

o Subject Matter

> This report analyzes the potential of biological processes as a renewable domestic source of solid, liquid, and gaseous fuels and chemical feedstocks. The report assesses the bioenergy resource base, conversion technologies, and end uses; analyzes the environmental and social impacts that could accompany the widespread use of bioenergy; and identifies policy options that would promote commercialization and proper resource management. In addition, the report highlights research and development needs and bioenergy's potential for displacing premium fuels. p. 17

2. Conditions of the Assessment

There is very little information in the report on these points. They seem not to have been specified. The report does note the uncertainties inherent in the subject matter:

> At present, significant uncertainties about land availability and quality, energy conversion costs, market characteristics, and other factors hinder the analysis of the biomass potential or the way the complex, varied, and interconnected markets will respond to bioenergy development. Although the uncertainties are very real, they are not debilitating. General trends can be discerned and analyses of them can be used in formulating policy, although many of the specific details will have to be refined as more information becomes available. Nonetheless, policymakers will have to weigh the uncertainties carefully in devising workable strategies for promoting bioenergy. p. 3

Also, regarding the use of wood:

> An examination of the data...leads to the conclusion that at this time it is impossible to predict in detail what the supply response to a strong demand for wood fuels will be. This, in turn, makes it difficult to predict accurately what the environmental and social impacts of such a demand will be. p. 59

3. Degree of Specification of Task

Specified only in very general terms. See Phase 1, above. Within this framework, OTA chose to focus on four bioenergy fuel cycles seen as those "likely to contribute significant amounts of energy within the next 20 years, ...contribute to energy self-sufficiency within a particular economic sector, or...provide a source of liquid fuels." p. 17 These are the alternatives, which are examined with respect to generic issues ("concerns") surrounding bioenergy; technical features, economic, environmental, and social impacts (effects) for each cycle; and policy options available to the Congress to "encourage the introduction of the four fuel cycles into U.S. energy supplies." p. 17

Thus the evolving social environment, system of affected participants, decision processes, and effects are all treated to a certain degree, though not systematically, and some better than others.

4. Alternatives -- Project Configurations

The alternatives are the four fuel cycles -- wood, alcohol, herbage, and animal wastes. These are not alternative actions, but alternative potential energy sources. They are not mutually exclusive, but all complementary in achieving the implied social goal of replacing conventional fuels (oil and natural gas). pp. 9-14

Each of these is examined taking into account the components of a P-C: technology, institutional process, formal authority, funding, management, scheduling, regulation, and institutional structure. Some factors are examined more thoroughly than others. This analysis is done mainly in Chapter 4: "Fuel Cycles and Their Impacts," which examines the technical, economic, environmental, and social considerations specific to each cycle.

The policy options outlined in Chapter 5 also present alternatives. But complete project configurations including one of the fuel cycles of Chapter 4 and an appropriate structure of policy options in Chapter 5 (plus the other components of a complete configuration) are not specified. However, there are various suggestions as to what might prove feasible under given conditions.

5. Evolving Social Environment

The analysis of social context in the OTA report is concentrated in the chapter on policy (Chapter 5). There is a general discussion of the institutional context on pp. 141-44 and more specific discussions related to each fuel cycle at 150-51, 156-61, 171-74, and 180.

- o The time period chosen by the writers of the report was the near- to mid-term, or approximately the next 20 years.
- o The geographic area is difficult to pin down. The report points out that by its very nature bioenergy is extremely scattered and site specific.
- o The jurisdictional dimensions are treated in Chapter 5 -- the national regulatory, legislative, and administrative factors are discussed, especially in the environmental area. State, local, and private sector aspects are dealt with only in passing because of the diversity and uncertainty of these factors.
- o Relevant conditioning factors and trends: some mention is made of most of these --

--public decision process: discussions of current policy and options for each area in Chapter 5. See Table 19, p. 150; Table 20, p. 161. Very little about process.

--process of technological innovation: very little about process.

--economic resource allocation:
Wood - pp. 68-74
Alcohol - pp. 96-104
Herbage - pp. 117-18
Manure - pp. 126-28 (it is noted that this option is the only one that does not compete directly with other uses)

--knowledge and skill capabilities:
Wood - pp. 60-67
Alcohol - pp. 90-95
Herbage - pp. 113-17
Manure - pp. 124-26

--societal behavioral patterns
--individual options
only a few mentions - such as willingness to change lifestyle for burning wood

--quality of environment:
Wood - pp. 75-82
Alcohol - pp. 104-109
Herbage - pp. 119-20
Manure - pp. 128 -30

o Techniques for Forecasting/Projecting:

> Any discussion of the social impacts of biomass energy is subject to a number of uncertainties that stem from the inappropriateness of impact assessment methodologies that were designed for large scale conventional energy projects and from the lack of knowledge about the magnitude and location of future biomass development. p. 57

All four methods are used:

> trend projection
> models of different energy futures (Table 16, p. 134
> Table 17, p. 136)
> alternative scenarios of biomass use
> preferred futures -- where more biomass replaces conventional energy

Summary of model analysis: Figure 36, p. 138
Model description: Appendix B

6. System of Affected Participants

o Relevant decision makers

There are many because of the nature of the energy. The report notes that both the quantity and quality of biomass and the "economic, environmental, and other consequences of obtaining it will depend critically on the behavior of growers and harvesters." p. x Also involved are Congress and Federal agencies, local governments, and users-consumers. But except for the above quote and a mention of lifestyle changes necessary for adoption of some biofuels, such as wood, the subject is not explored in detail.

o Future generations

This aspect is especially important regarding environmental concerns. These are discussed in depth, but the question of future generations is only treated by implication. The comment is made that the Federal Government "tends to direct its attention and funding toward existing recognized problem areas and, thus, can give very little attention to long-range planning or to researching emerging and potential future problems." p. 179

These two areas are also treated somewhat in the "three main policy issues that Congress might choose to address" -- see Phase 10, below, from p. x of the Report.

7. Relevant Structure of Authoritative and Controlling Decision

- o arenas
- o process

Both arenas and process of decision are slighted in the assessment, the only mention being as noted in Phase 6, above.

8. Effects Identification and Measurement

- o One major effect assessed: potential for displacement of oil and natural gas
  - -- economic considerations: competition from non-energy uses of feedstocks will affect cost and reliability. p. 9
  - -- environmental impacts: in general few problems and important benefits, but hard to monitor and enforce because of smallness. p. 11
  - -- social impacts: limited mainly to discussion of effects on labor market and occupational safety. pp. 12-13
- o The effects of each fuel cycle are discussed in Chapter 4: "Fuel Cycles and Their Impacts."

This analysis is done using expert opinion, analogy (projection of current trends), and modelling. A good deal of contingency thinking is employed.

9. Social Impact Evaluation

Social impact evaluation is relevant but not specified and not much used. The report by implication states that certain actions will promote certain values, but this is not done explicitly. For example:

general advantages and disadvantages of biomass-- (p. 141)

--renewable, domestic, help pollution and waste disposal problems, decentralization of economic activity

--hard to monitor and regulate because of:
a) character of technology and dependence on diverse source material
b) incompatibility with existing energy distribution and production system

There is a limited legal/institutional analysis regarding the degree to which the decision process will facilitate or constrain achievement of these values:

> Both the energy potential of biomass and the problems inherent in achieving that potential raise three main policy issues that Congress might choose to address.
>
> First, vigorous policy support will be necessary if bioenergy use is to reach 12 to 17 Quads/yr by 2000....
>
> Second,...incentives for bioenergy development should include provisions for periodic review and adjustment....
>
> Third, bioenergy currently remains a low priority in the Departments of Energy and Agriculture.... The aggressive promotion of bioenergy therefore will require a reorientation of Federal program goals, as well as extensive coordination among Federal agencies, and among National, State, and local governments.
>
> p. x

Chapter 3: "Issues and Findings," expresses "concerns," but these are questions to be answered rather than values and attitudes which might influence the introduction of biofuels and their impacts. This seems to be more in the nature of an issue analysis and evaluation than an assess-

ment of concerns. In Chapter 3 the various factors are discussed which will influence the following:

-- how much energy can the US get from biomass?
-- main factors affecting reliability?
-- economic costs and benefits?
-- potential to displace conventional fuels?
-- does gasohol production compete with food production?
-- can feedstocks be obtained without damaging the environment?
   here the report points out that regulatory incentives are very weak, and economic incentives mixed: short vs. long term.
-- major social effects?

> It should be emphasized that the potential for conflict between bioenergy and agriculture involves only a small fraction of the total biomass resource base, but that fraction is capable of causing a major conflict. p. 43

(affects potential for norm resolution)

-- problems and benefits of small-scale processes?
   environmental effects, social considerations, especially convenience factors
-- key R&D needs?
-- principal policy considerations?
   a) more carefully tailored policies because of wide range
   b) uncertainties need careful monitoring

10. Assessment Outcome Presentation

This is an assessment pursuant to major issues posed with findings and conclusions. See especially p. 49 and pp. 185-88.

The findings are stated in Chapters 3, 4, and 5, which discuss concerns, effects, and current policy. The policy issues are stated as three questions:

> 1) whether to adopt policies to promote the growth of bioenergy beyond those levels that will be reached through the operation of market forces in conjunction with incentives and subsidies that already have been approved; 2) whether to change the character or size of existing incentives and subsidies that affect bioenergy; and 3) whether to adopt new policies to manage the impact on soils, forests, the environment, and society that will accompany the growth of these new sources of energy. p. 185

These are answered by OTA as follows:

> First, vigorous policy support will be necessary if bioenergy use is to reach 12 to 17 Quads/yr by 2000. This support could take the form of economic incentives to accelerate the introduction of bioenergy and to promote the establishment of reliable supply infrastructures.
>
> Second, because of the unresolved questions about the biomass resource base, the way the complex and interconnected markets will respond, and how constraints will change with time, incentives for bioenergy development should include provisions for periodic review and adjustment....
>
> Third, bioenergy currently remains a low priority in the Departments of Energy and Agriculture--the Federal agencies able to directly influence the speed and direction of development. The aggressive promotion of bioenergy therefore will require a reorientation of Federal program goals, as well as extensive coordination among Federal agencies, and among National, State, and local governments. p. x

More specific recommendations are made for each of the four fuel cycles because of their differing benefits, problems, and shares in the energy supply.

B. Summary Evaluation of Energy from Biomass Processes

This rather timely report reflects an intensive effort to examine the energy potential from renewable biomass resources. As with the other studies previously considered, this study has its own peculiarities and does not fit snugly into a standardized evaluative framework. It is the intention of the reviewer to give only passing attention to the Adequacy criteria of Interpretability and Warrantability with respect to the study. Primary attention will be given to the criterion of Serviceability. The basic question posed is: How useful is this study to relevant decision makers?

This study is quite readable and, for the most part, should be Understandable to anyone seriously interested in biomass energy resources.

Comments and caveats follow:

- The charts, photos, and schematics have been skillfully employed.
- The format and organization of the report contribute to readability. Emphasis to important points by heavy type assists understanding.
- The "successive refinement" of the effects/impacts of biomass processes through Chapters 1, 3, and 4 eases the reader into increasing clarity and detail.
- This study is strong in the identification of effects of alternative fuel cycles.
- Particular attention is also given to the energy potential of biomass under varying conditions involving policy choices, private choices among producers and consumers, and market reactions.
- Hence, the study does convey -- at least to this reviewer -- both the energy potential in biomass processes and the implications of such processes under varying sets of conditions.
- However, a caveat of sorts must be introduced. This study responds to a request for "an evaluation of the energy potential of various sources of plant and animal matter (biomass)." It is slightly surprising then to note that the Summary covers not only Energy Potential from Biomass but also Potential for Displacement of Oil and Natural Gas, Economic Considerations, Environmental Impacts, Social Impacts, and Policy Considerations. It is not until one gets to p. 17 with the statement commencing: "This report analyzes..." that a feeling for the OTA's conception of the assessment task begins to come clear. It might be helpful in such reports if the OTA interpretation of its assignment were placed up front so that the reader is aware from the very beginning of the subject matter being addressed. Reading the charge of the Foreword, this reviewer would not have anticipated the extensive treatment given to impacts.

Various aspects of Warrantability have been treated in the prior matrix analysis so only a few comments are included here.

- o The "successive refinement" of effects noted above actually involves more than a development of increasing detail. It seems that OTA designed the assessment task so as to make use of several somewhat different references. That is, the Summary is a statement of the principal findings and implicit recommendations (Policy Considerations, p. 14). Then Chapter 3 looks at Issues and Findings and is an expansion of the Summary. But it also addresses issues which focus primarily on likely or possible effects. Chapter 4 gets still more explicit re effects in the assessment of alternative fuel cycles. This provides not only a cumulative and effective means of conveying useful information to the reader but probably gives added insight into the identification and implication of effects since different references and perspectives are employed in Chapter 2 and Chapter 4.

- o The uncertainties in projecting and identifying effects (and in some instances the social impacts) are emphasized throughout the report.

- o The thrust of alternative evaluation is contained in Chapter 4 on Fuel Cycles and Their Impacts. This is a more positive and analytical treatment than is found in Chapter 5 on Policy where "policy options" are considered. However, the policy options are not stated as firmly as those in the Medical Technology study nor are they treated in as analytical a manner. This is not necessarily a fault with the study. But the numerous highly specific policy options available with respect to each fuel cycle left one wishing that a selected few options had been given a full analytical treatment, especially in terms of the legal/institutional factors which might promote or impede their authorization and implementation.

- o The broad scope of the study task as interpreted by OTA and the necessity of dealing with at least four different biomass fuel cycles and multiple policy options did not permit the more intensive consideration of relatively explicit policy options presented in the Medical Technology study. There, while much discretion was left to OTA, the CEA/CBA techniques being examined in the context of six health service programs permitted a more focused identification and analysis of policy options.

- o The biomass study demonstrated the innumerable policy and programmatic initiatives available. Hence, it would be expected that heavy reliance would be placed on the use of assumptions and of contingency inquiry.

Throughout the report the question continued to press the reviewer as to just what the utility of the study might be to prospective users, in particular to relevant decision makers. In other words, what can be said about the Serviceability of the report? The vast variety of issues and considerations involved with the energy potential of biomass makes this a difficult question to answer but several comments follow:

- Decision makers are at least given a good idea of the maximum energy potential which might be expected from a fully developed biomass program. They are told what technology is needed for such a program (p. 48) and are made aware of many potential impacts -- food supply, land in use, forest depletion, competitive effects, social impacts, etc.

- While note is made that "any increased food prices caused by bioenergy production would fall disproportionately on the poor because the purchase of food takes a greater share of their disposable income" (p. 13), there does not seem to be much amplification of this distributive factor beyond the Summary.

- It is useful to note that "the reliability of biomass fuels is likely to become an important issue only when very large amounts enter the supply stream." (p. 30)

- Certain issues discussed are of considerable importance: the potential of biomass for displacing conventional fuels (p. 34), and the potential competition between gasohol production and food production (p. 39). The environmental and social issues are also of significance. (pp. 39-43)

- The point concerning the difficulty of regulating small-scale systems is a good one. (p. 47)

- The link between the uncertainties connected with biomass processes and the need for continuing monitoring and periodic change is a critical point. (p. 49) However, the institutional processes through which monitoring and modification will likely take place seem nowhere to be systematically and explicitly set forth.

- The Introduction to Chapter 4 on Fuel Cycles and Their Impacts helped to explain further some of the effects and implications previously noted. Some insight is provided into value preferences and potential value conflicts. Decentralization has certain advantages and disadvantages (difficulties of regulation, p. 53). Social Implications - Generic Concerns on p. 57 is especially useful. This short section contributes to social value sensitivity. (pp. 57-58) Figure 9 on p. 55 comparing the environmental risks of biomass vs. coal is a useful display.

- Highlighting major social impacts such as those of the wood cycle on p. 83 gives the reader a quick grasp of the problem and conveys to decision makers potential conflicts over concerns (employment, health and safety, tax revenues, etc.).

- With Chapter 5 on Policy the reader has still another reference of analysis in that it considers "policy options that would encourage the introduction of the four fuel cycles into U.S. energy supplies." (p. 17, Chapter 2). This additional "cut" does provide new insight, but its non site specific treatment leaves an awful lot of loose ends dangling.

- A very interesting statement appears on p. 141: "Depending upon the technologies that are adopted and the scale of production chosen, biomass energy may provide the basis for the growth of small business enterprises and the decentralization of economic activity." This statement is indicative of the pervasive use of contingency thinking (perhaps appropriately) in the study. Such thinking (assuming such and such) simply reflects the lack of specificity about proposed actions and the high level of uncertainty about the potential effects of actions even if specified. In short, the study employs a lot of "ifs." But, the panoply of policy options is set forth suggesting possibilities for use in specific situations.

- In the Policy chapter many highly specific policy options are listed. However, they are not assessed in strict analytical terms with respect to alternative fuel cycles, jurisdictions, technology, markets, etc. So this discussion, while informative, is far from site specific and will leave many questions for those having to do with the authorization, implementation and operation of particular activities. However, there are so many potentially different situations that it is understandable why this study did not find it particularly useful or perhaps feasible to go into further detailed analysis.

- It is likely that decision makers and others affected by new initiatives in the biomass energy area have found the Conclusion to Chapter 5: Biomass and National Energy Policy (pp. 185-88) to be an extremely helpful short statement of the potential and probability of biomass energy development.

  - Biomass energy contribution by year 2000 is estimated under different assumptions, including doing nothing over and above normal development of current activity.

  - Displacement energy advantages are noted. It is also indicated that Chapter 5 has attempted to facilitate the making of choices if additional emphasis is to be given to biomass development.

  - It is noted that several measures have been passed by the Congress affecting biomass. Mention of "key policy alternatives" is then made -- measures that would improve the prospects for bioenergy.

  - More carefully tailored statutory schemes (programs) are suggested as an efficacious means of proceeding, i.e., those directed to the concerns of producers and users of different biomass processes.

  - Better forest management practices are recommended, as are programs to provide information and technical assistance.

  - The uncertainty of the impact of policies is again stressed, but the price of conventional fuels is noted as a most important determinant.

  - With respect to gasohol, the complex legislative and regulatory structure is noted and then it is stated that "Should the United States choose to promote the rapid expansion of the use of gasohol made with ethanol from grain and sugar crops, policy support will be needed to:...." Again, we see the need to resort to contingency thinking. This is, perhaps, an acceptable statement but it should not be forgotten that the main purpose of the study was to help answer whether or not the U.S. should embark on such a policy.

  - The important policy issues raised by the prospect of increasing and supporting gasohol production are enumerated.

  - The need for continuing monitoring and periodic change in laws and regulations arising out of the uncertainty of policy impacts and related practices is again emphasized. The need for regulatory controls to protect from environmental and social dangers is also noted.

  - The reader's attention is again drawn to the need to assess just what contribution can be or will be made by biomass produced energy at particular times in the future toward the displacement of other fuels.

- Some rather interesting comments are made in Appendix A, p. 191, with reference to Key Technological Developments needed to Help Reach the Bioenergy Potential.

  - Attention is invited to the need for data to serve national, state, and local decision makers. (p. 192)

  - It is suggested that methodologies should be developed to help establish the indirect costs associated with bioenergy, particularly the competition with food and feed (p. 193) -- a "long term" need.

- Although it is nowhere explicitly stated, one is left with an impression after reading this report that even assuming an appreciable net social benefit from the use of biomass energy resources --

  <u>To put in place a fully comprehensive and coherent national policy and program (clusters of many policies and programs) will be a tremendously complicated task.</u>

  - Existing policies and programs will need to be checked for inconsistencies with such a biomass program and for any avoidable barriers they may present.

  - It will have to be determined what policies and programs must be activated at the Federal level and what policies and programs must be authorized and implemented at the regional, State, or local levels. This could differ among the alternative biomass fuel cycles.

  - An extraordinary amount of cooperative effort will be required among Federal, State, and local officials in any event.

  - Essential R&D, marketing arrangements, etc. will need to be synchronized with private sector entitities. Incentives may be necessary in many situations.

  - Continuing monitoring, review, and revisions of statutes and programs will be essential to the effective operation of the overall system, not only in terms of biomass energy production and use but with respect to indirect costs affecting the environment, living styles, and other social conditions.

  - Periodic assessments should be made to determine as best we can whether the benefits derived from this complex scheme of operations actually exceed the total costs. However, modifying or even dismantling such an intricate scheme as is here suggested will eventually become an extremely difficult task -- even if thought desirable.

- In sum, it can be said with respect to Serviceability that this is a very useful exploratory study of energy from biomass.

  - It clearly is a valuable source of information covering the potential of biomass energy, the available fuel cycles, the major issues, and the variety of policy techniques which might be used to promote energy production from biomass.

  - This study does present a comprehensive overview (and much detail) concerning the general problem of energy from biomass, and the report provides essentially all of the source material that will be needed in the design of an overall biomass policy/program as well as in assessing the utility of particular fuel cycles and policy actions.

  - It is particularly useful to all users in identifying the range of effects which will or may result from different levels of biomass energy production. The report is particularly strong on the identification of effects.

  - It is useful as guidance for decision makers to the extent that it emphasizes actions (including R&D and policy initiatives) which might be taken to realize the full potential of energy from biomass.

  - It does not, however, set forth detailed project configurations for the ready authorization by Congress (or by the States or localities). As previously indicated, how far it is useful for OTA to go in this direction is always a difficult problem of judgment and of time and resource constraints. The open-end types of requests presented leave much discretion in OTA and it is necessary to determine in each instance just what type of assessment and presentation will be most serviceable to the Congress.

  - It is debatable the extent to which the study might have been of more use to the Congress if more explicit project configurations had been developed (assuming resources permitted) or if more positive recommendations had been made (not the usual OTA style). See in this connection the apparently more direct conclusions drawn from the study of the U.S. National Alcohol Fuels Commission. (C&EN, 19 January 1981, at 81)

X. Comments and Questions Concerning Studies by OTA

This paper has undertaken to describe certain policy analysis approaches (primarily anticipatory assessment) which have been used by PPS/GWU in the performance of various analyses and studies over the past 14 years. The methodologies set forth have been applied for the most part in analyzing proposed or potential actions which have tended toward the project specific type of assessment context. Hence, most of our experience has been directed to assessment tasks which have been somewhat more highly specified than the normal task-objectives presented to OTA. Nevertheless, the evaluative framework set forth herein in Part V (derived by drawing upon the various methodologies used by PPS/GWU) provides one useful means for critiquing OTA studies.

This review has dealt basically with OTA methodology and performance of particular studies. While useful, it has not served to this point to place the OTA function in the larger policy analysis context. To do so might help to clarify the OTA function and in turn to facilitate further evaluations of the various methodologies applied by OTA in its many studies. While this is not feasible under present circumstances, perhaps a schematic of selected questions can convey some idea of the issues which might be explored to the benefit of OTA. These questions are based not only on the assessment approaches of PPS/GWU described and applied herein but include a more general concept developed by PPS termed the System of Technology Assessment. Such system would be inclusive of all the appraisal activities conducted in the public decision process which are involved with technological applications -- existing or proposed. Further, the questions posed reflect three observational standpoints so as to present a broad perspective on the technology assessment function. This schematic is set forth on the following pages. It is emphasized that the questions are only illustrative. They are by no means inclusive of all relevant questions.

QUESTIONS PERTINENT TO THE EVALUATION OF ASSESSMENT METHODOLOGIES

ɔt	Questions re the System of TA in General	Questions re OTA -- in General	Questions re specific OTA Studies
OF LOGY MENT	o What is the Basic Purpose of TA in the Public Decision Process? o How do the Missions of Particular TA Subsystems Differ? Why? o What are the Strengths and Weaknesses of TA Subsystems in terms of their Feed-in to the Relevant Decision Making Entities? o How might the Weaknesses/Gaps in the Capabilities of the TA Subsystems be Remedied? o What Identifiable Contributions to Societal Viability have Resulted from the System of TA?	o What Legal Mission is Prescribed for the OTA? o Is the Legal Mission Realistic in terms of Resources and Reasonable Expectations? o How does the OTA actually View its Mission? How does this Perception Duplicate or Differ from what Other TA Entities do? o Is the Congress always the Intended Primary User of OTA Reports? o Are Policy Option Outcomes the Best and Only Type Usable by the Congress? o What deficiencies, if any, are Perceived by the OTA Staff in its Normal Performance? Does it Regularly Perform up to Congressional Expectations? Why? If not, Why not?	o What, Precisely, is the Task-Objective? o What other TA Subsystems have Performed Similar Studies? o What were the Strengths or Weaknesses in such Studies? o Have Similar Studies by other TA Subsystems Contributed to Informed Decisions? Why? Why not? o To what Extent is the Assessment Task Specified or, on the Contrary, Unspecified, thereby Leaving Discretion to OTA? o How might the Assessment Task be Reformulated so as to be of Maximum Benefit to the Congressional Units Requesting the Study? o What Technical Assessment Design Will Most Likely Achieve Such an Outcome?
ICAL	o To What Extent is this Mode of Assessment Utilized by Other TA Subsystems? Why? o In What Circumstances is this Mode of Assessment Prescribed by Statute or otherwise Required? o What Patterns of Assessment are Responsive to this Mode of Assessment? Why? o What Patterns of Assessment Task-Objectives have not been Responsive to this Mode of Assessment? Why? o What Resources (Funding, Analytical Skills, Information, Techniques of Inquiry, etc.) are Essential to this Mode of Assessment? o What have been Determined to be the Major Strengths and Weaknesses of this Mode of Assessment? o What Identifiable Contributions has the Analytical Mode Made to the Utility of the TA System?	o Is this Mode of Assessment Prescribed for OTA? o Has OTA Made Use of this Mode of Assessment? With Respect to What Types of Task-Objectives? Why? o Why has not this Mode of Assessment been used by OTA with Reference to Particular Assessments? o What has OTA Learned from other TA Subsystems about the Strengths and Weaknesses of this Mode of Assessment? o Does a Limit on Resources in any Way Inhibit Use of the Analytical Mode by OTA? o Does the Analytical Mode offer a Fundamental Way of Thinking About TA for the Congress in View of the Normal Policy Option Outcome of OTA Assessments?	o Does the Particular Task-Objective Pose the Assessment Task in Instrumental Terms? o Are the Alternatives (Project Configurations) Specified? In General? In Highly Defined Terms? Or Must OTA Invent the Alternatives? o To What Extent are the other Elements and Operations (Phases of the Matrix) Specified? What does this Indicate/Dictate in Terms of Methodology and Type of Outcome? o Will the Main Thrust of the Assessment be to Identify Policy Options? If so, then to what Extent Should Each of the Policy Options be Subjected to a Thorough Assessment Itself in Accord with the PPS/GWU Evaluative Framework? o What Features of the Assessment Task and Methodology Adopted Encourage an Approximate Benefit/Cost Outcome Presentation for Each Policy Option?

QUESTIONS PERTINENT TO THE EVALUATION OF ASSESSMENT METHODOLOGIES
(continued)

t	Questions re the System of TA in General	Questions re OTA -- in General	Questions re specific OTA Studies
N CH	o What are the Major Concerns Expressed re Technologically-Based Actions? o What are the More Critical Social Value Tensions and Institutional Conflicts Arising from the Assertions of Concerns? o How have TA Subsystems Undertaken to Manage Conflict as an Element of the Technical Assessment Design? o How have TA Subsystems Adjusted Between Use of Prescribed or Posited Evaluative Criteria on the one hand and Empirical Concerns as an Evluative Reference on the other? o What Controversies (Conflicts Engendered by Concerns) have Relevant Authoritative Decision Processes been Equipped to Handle? Not Equipped to Handle? Why? o How Useful has Concern Analysis been for Responsible Decision Makers? o What Types of Task-Objectives are Particularly Amenable to the Concern Approach? o What are some of the Conceptual Implications of Using the Concern Approach?	o Has OTA made Use of the Concern Approach? o In what Types of Task-Objectives has it Proven Useful? Why? o What has OTA Learned from other TA Subsystems re the Utility of the Concern Approach? o Why or Why Not has this Assessment Approach Proven to be Useful to OTA Assessment Performance? o Are there Particular Reasons why OTA does Not Wish to Employ the Concern Approach? o Is the Treatment of Controversy re Policy Option Authorization and Implementation Simply Uncongenial to the OTA Role?	o Is the Particular Task-Objective Amenable to Assessment by Concern Analysis? o How can the Concerns (Issues of Concern) Best Be Organized into Categories for Explication? o Will this Categorization be Inclusive of All Issues of Concerns of the Three Primary User Groups? o What will be the Procedure for Determining the Significance of the Concern Categories? o How will the Impact of Alternative Project Configurations on Concern Categories be Determined (Alleviations and Exacerbations)? o Will Explication of Concerns by Determining Potential Difficulty of Norm Resolution be a Serviceable Outcome? If not, then how are Concerns to be Illuminated for the Three User Groups?
./ ITUTIONAL YSIS	o To What Extent has Legal/Institutional Analysis been Specifically and Explicitly Applied by Various TA Subsystems? o Has this Assessment Approach ever been Prescribed by Statute or Authoritative Rule? o What Patterns of Assessment Task-Objectives have been Most Responsive to this Approach? Why? o What Patterns of Task-Objectives are Not Amenable to this Approach? o Are Special Resources Required for this Approach? o What are the Major Strengths and Weaknesses of this Approach as Derived from Experience of Various TA Subsystems? o What Identifiable Contributions has the Legal/Institutional Approach Made to the Utility of the TA System for Informing Responsible Decisional Entities?	o Has OTA Found that Precise Specification of a Proposed Action (Alternatives) is Essential for Effective Use of this Approach? o Has OTA Found that this Approach Demands Precision in the Description of Alternative Project Configurations? o Why has - or has not - OTA Applied this Approach Explicitly in Specific Assessment Situations? o What has OTA Learned from Other TA Subsystems as to the Strengths and Weaknesses of this Approach? o What Special Resources, if any, are Required for the Application of this Approach? o Would not this Approach be Extremely Useful to those Users Who have (or accept) Responsibility for the Initiation, Authorization, Implementation, and Operation of any Given Configuration	o Is the Particular Task-Objective Amenable to a Legal/Institutional Analysis? o Are Project Configurations Specified in Detail or must OTA Perform this Function? o Will this Approach Address or Illuminate All of the Major Issues Raised by the Proposed Action? o Why might this Approach Provide a More Serviceable Outcome for the Three Primary User Groups than Alternative Methodologies?

QUESTIONS PERTINENT TO THE EVALUATION OF ASSESSMENT METHODOLOGIES
(continued)

cept	Questions re the System of TA in General	Questions re OTA -- in General	Questions re specific OTA Studies
TERIA FOR LUATING ESSMENT FORMANCE	o At What Phases of the Assessment Process Should the Performance be Evaluated? o To What Extent have Explicit Evaluative Schemes been Developed and Applied by the various TA Subsystems? o Do any Authoritative Sources Prescribe Evaluative Criteria for Policy Analysis or TA? o How Might a Scheme of Appropriate Evaluative Criteria Differ with the Patterns of Task-Objectives? o Are Special Resources Required for Effective Application of the Evaluative Function? o How does Evaluation Improve the Overall TA Function? How can this Result be Demonstrated? o What are the Strengths and Weaknesses in the PPS/GWU Evaluative Criteria of: Interpretability, Warrantability, and Serviceability?	o What Evaluative Approaches have been Established by OTA? Criteria? Advisory Boards? Peer Reviews? OTA Hierarchical Reviews? Independent OTA Unit? o Does OTA have a Standardized Approach? Or is the Evaluative Function Designed for Each Assessment Task? o What Impact has the Evaluative Function had on OTA Methodology? Type of Assessment Approach? Organization of the Assessment Project Team? Continuing Revision of Evaluation Procedures? o What Impact has the Evaluative Function had on the Quality of OTA Studies in terms of Interpretability, Warrantability, and Serviceability? o What has OTA Learned from other TA Subsystems which has Improved its Evaluative Procedures? o What Means does OTA Use to Continuously Upgrade the Evaluative Function re its Studies?	o At what Phases of this Study Should Evaluations be made? o What Internal Quality Controls should be Initiated in Order to Assure a Warrantable Report? o What Provision is made for Continuing Integration of the Contributions of the Various Members of the Project Staff? o Has a Provisional Outline of the Final Report been Developed as a Reference for Continuing Revision? o What Guidelines are Established for Organizing and Drafting the Report so as to make it Clearly Understandable to All Users? o What Criteria are Established for Gauging the Likely Serviceability of the Study Report for the Three User Groups?