ORNL/TM-6171

Environmental Considerations for Inclusion in Program Opportunity Notices, Requests for Proposals, and Environmental Reports: Fossil Energy Demonstration Plants

M. S. Salk
J. N. Baird
L. W. Barnthouse
L. G. Berry
R. D. Roop
F. S. Sanders

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National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
Price: Printed Copy $4.50 ; Microfiche $3.00

ORNL/TM-6171

Contract W-7405-eng-26

ENVIRONMENTAL CONSIDERATIONS FOR INCLUSION IN PROGRAM OPPORTUNITY NOTICES, REQUESTS FOR PROPOSALS, AND ENVIRONMENTAL REPORTS: FOSSIL ENERGY DEMONSTRATION PLANTS

M. S. Salk, Leader*

J. N. Baird† L. G. Berry‡
L. W. Barnthouse* R. D. Roop*

F. S. Sanders*

January 1978

PREPARED FOR

Plant Initial Operations/Materials and Components
Division of Coal Conversion
Fossil Energy Program Administration
Department of Energy

PREPARED BY

Fossil Energy Environmental Project
C. R. Boston,‡ Project Manager

*Environmental Sciences Division

†Consultant, Energy Division

‡Energy Division

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
operated by
UNION CARBIDE CORPORATION
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ABSTRACT

This document was prepared for the Department of Energy, Division of Coal Conversion, for use in developing Program Opportunity Notices (PON), Requests for Proposals (RFP), and Environmental Reports (ER). Environmental considerations to be addressed by Offerors and Contractors are divided into three parts that correspond to the separate stages of project development: (1) the Offeror's response to the PON or RFP; (2) the Contractor's performance of baseline data collection and environmental impact assessment that results in an Environmental Report (ER) for use by DOE in the preparation of an Environmental Impact Statement (EIS); and (3) the Contractor's continuance of environmental monitoring and assessment during construction and operation.

FOREWORD

Environmental analysis and environmental protection are an integral part of the Offeror's or Contractor's performance under contract to DOE. Consideration should be given to the health and socioeconomic status of man as well as to the physical and biological environment. The Offeror's or Contractor's consideration of and commitment to avoiding adverse environmental impacts must be demonstrated at every stage of the process from planning through construction and operation. The requirements for environmental consideration that follow are divided into three sections that correspond to the separate stages of project development:

1. responding to Program Opportunity Notices (PON) or to Requests for Proposals (RFP);

2. collecting baseline data and assessing environmental impacts in order to produce an Environmental Report (ER) to be used by DOE for the preparation of an Environmental Impact Statement (EIS), in accordance with the requirements of 10 CFR Part 711; and

3. establishing a continuing program of environmental analysis, which should include monitoring and assessment during construction and operation.

Part 1 of this document, entitled "Environmental Factors to be Addressed in Response to Program Opportunity Notices and Requests for Proposals for Fossil Demonstration Plants," describes the factors the Offeror should address in demonstrating that environmental matters have been considered in the initial project plans and that environmentally sound criteria for site selection have been or will be used. Part 1 also indicates how the Offeror should demonstrate that environmental protection

will be considered during all stages from the planning process through plant construction and operation.

Part 2, entitled "General Requirements for Environmental Reports for Fossil Energy Demonstration Plants," describes the Contractor's initial responsibilities if awarded a contract from DOE. The Contractor will be required to plan and implement a monitoring program to collect baseline data to be used to predict the beneficial and adverse impacts of constructing and operating the proposed facility. This information will be submitted to DOE in the form of an ER with sufficient detail so that DOE can fulfill its requirements under NEPA to prepare an EIS. This ER preparation will require that the Contractor make a complete analysis of the interaction between the proposed demonstration facility and the prevailing environment, both natural and socioeconomic.

On December 12, 1977, the report *Council on Environmental Quality Draft Regulations to Implement the National Environmental Policy Act* was issued for interagency review. When final regulations go into effect, it may be necessary to revise Part 2 of this document.

Issuance of the draft EIS by DOE is expected to require approximately three to four months after receipt of an acceptable ER. Issuance of the final EIS will require approximately one to three months from the receipt of the last comments on the draft EIS. Assuming a comment period of one and one-half to two months, the total elapsed time between acceptance of the ER and issuance of the final EIS is expected to be approximately six to nine months.

Part 3, entitled "Continuing Environmental Responsibilities of Contractors for Fossil Energy Demonstration Plants," describes ongoing environmental monitoring and impact assessment for which the Contractor will be responsible during construction and operation. The purpose of this requirement is to determine which, if any, adverse or beneficial environmental impacts have occurred, including both those that were postulated prior to the project development and those that were unsuspected. This consideration includes a possible need for mitigating adverse impacts as they are encountered during the construction and operational phases of the demonstration plant activity. The Contractor must operate the plant in compliance with all Federal, state, and local laws and regulations. Finally, the Contractor should be aware of ongoing research that may affect the project.

At the present stage of development of these new technologies, it is not possible to delineate in detail all parameters that should be monitored. However, at a minimum, the parameters will include all pollutants or contaminant species designated or legislated by Federal, state, and local governmental agencies and those designated by DOE for special consideration in its technology development and demonstration programs. In addition, the sampling methods for important parameters and source term characteristics for potentially hazardous pollutants are still in an early stage of development. Therefore, it is not possible

at this time to state precisely which emissions from demonstration facilities should be regularly monitored or by which methods. As ongoing research answers some of these current uncertainties, DOE will define more clearly which emissions should be monitored, at what frequencies, and by which methods. More detailed information on preconstruction, construction, and operational monitoring is also available in *Environmental Monitoring Handbook for Coal Conversion Facilities*, ORNL-5319.

1. ENVIRONMENTAL FACTORS TO BE ADDRESSED IN RESPONSE TO PROGRAM OPPORTUNITY NOTICES AND REQUESTS FOR PROPOSALS FOR FOSSIL ENERGY DEMONSTRATION PLANTS

1.1 Introduction

In the response to Program Opportunity Notices (PON) and Requests for Proposals (RFP), the Offeror should demonstrate the ability to undertake environmental analysis and provide environmental protection in conformance with all local, state, and Federal statutes, regulations, and guidelines. The proposal should demonstrate the ability and resources of the Offeror to do the following tasks:

1. apply environmentally sound criteria in site selection;

2. plan and implement a monitoring program to collect baseline data, make a complete analysis of the interaction between the proposed demonstration facility and the prevailing environment, both natural and socioeconomic, and submit this information in the form of an Environment Report (ER) for use in fulfilling NEPA requirements;

3. plan and implement a monitoring program to measure the impacts of constructing and operating the demonstration facility;

4. mitigate any adverse environmental impacts which may result from construction and operation of the demonstration facility; and

5. operate the demonstration plant in compliance with all Federal, state, and local laws.

1.2 Outline of Factors

The Offeror should include as part of the response to the PON or RFP (1) a general assessment of the environmental and socioeconomic impacts associated with the construction and operation of the demonstration plant on the Offeror's site, (2) a detailed description of the Offeror's approach in assessing these impacts, and (3) plans for mitigating impacts.

The Offeror's response shall address these factors in conformance with the following subject outline and format:

1. a summary;

2. a brief description of the proposed conversion plant, its products, its effluents, and its pollution-control systems;

3. a detailed description of the Offeror's approach to environmental analysis and protection, including but not limited to

   a. a preliminary outline of the criteria for site selection;

   b. an initial characterization of the existing environment likely to be affected by the proposed plant operation and construction;

   c. an inventory of anticipated environmental and social impacts resulting from demonstration plant operation and construction;

   d. a complete discussion of plant design features and operational procedures necessary to mitigate adverse environmental impacts;

   e. a preliminary identification of unavoidable adverse environmental impacts;

   f. a discussion of irreversible and irretrievable commitment of resources;

   g. a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity;

   h. a discussion of unresolved environmental issues and data deficiencies, that is, identification of the areas of uncertainty;

   i. a discussion of the applicable laws and regulations and the steps needed to operate in compliance with them; and

   j. a detailed work plan and schedule for submission of the Environmental Report.

DOE recognizes that the Offeror may be unable to provide highly detailed responses to all of these factors. Given the time frame for the RFP or PON response, the Offeror may have to rely on environmental information present in published literature or present in existing data banks, rather than information collected at a proposed plant location. Studies, reports, and other information sources used in preparing this proposal should be identified and made available to DOE upon request. The level of information in the proposal response should match the level of knowledge of plant design, plant process streams and effluents, and the plant site location. The following sections describe in detail what is expected for each part of the proposal as outlined above.

1.3 Detail of Factors

1.3.1 Summary

The Offeror should present a summary of the environmental material given in the proposal. Emphasis should be on the following:

1. a synopsis of the predicted beneficial and detrimental environmental effects of the proposed action;

2. any factual conclusions concerning the significance of the environmental impacts associated with the proposed action; and

3. all unresolved environmental issues and unquantified plant effluent emissions which may affect the environmental impact and analysis given herein, especially the identification of information that cannot at present be supplied on details of the conversion process streams, effluent composition and control, fugitive emissions, mitigation procedures, and socioeconomic impacts.

1.3.2 Brief description of the proposed conversion plant

A brief description of the proposed plant should be given, including at least an overall characterization of the major plant structures, water needs (consumptive and returnable), utility needs, personnel requirements, process streams (both primary and by-product), and effluents and their sources. The description should emphasize features that will have environmental significance and should include details of both plant construction and operation. The magnitude of the proposed activity should be given as well as figures, maps, tables, and pictures where appropriate. At least the following features should be covered: land commitment, utility corridors, holding ponds, ash/slag disposal areas, water intake and discharge structures, auxiliary facilities, and storage areas for coal, sulfur, products, and by-products. The duration of construction and operation of the proposed plant and the relationship of this project to other relevant DOE projects, such as pilot plants and research projects, should be given.

The expected quantity and composition of all effluent streams and the discharge point(s) should be given. The Offeror should be as specific as possible about the effluents to be released, including the types of compounds likely to be discharged into receiving bodies (air, water, or landfills). References to specific documents that detail such effluent emissions should be made and be included in the text as tables or charts where practical. In the description of the proposed plant design and operation, the knowledge of the effluent stream compositions with respect to their toxic properties or potential environmental impacts should be stressed, including any lack of information on effluent evaluation and characterization. Toxic or potentially environmentally damaging compounds or effluents to be considered should include heat, toxic trace elements,

potentially toxic organic compounds, sulfur compounds, nitrogen compounds, other potentially toxic effluents, and odor and taste contaminants. When practical, each source of potential emissions from the plant, either gaseous, liquid, or solid, should be characterized; this precaution also includes fugitive emissions. The expected noise levels and visual impacts should be evaluated.

1.3.3 Detailed description of Offeror's approach to environmental analysis and protection

If a specific plant site location has not been determined before a proposal is submitted, many of the following environmental considerations should refer to the general area that the Offeror is considering, such as a specific county.

1.3.3.1 Plant site selection criteria. The Offeror shall discuss the criteria used to select the plant site, including the relative importance of each criterion. This discussion should include, but should not be limited to, (1) uses of adjacent lands and waters, including conformity to existing regional and local land and water use plans; (2) nearby highways, railways, waterways, feedstock supplies, and utilities that are necessary for plant operation; (3) sources of construction labor including evaluation of manpower curves for the project; (4) topographic and hydrological features that may affect dispersion of effluent streams; (5) socioeconomic effects (including aesthetic) that might be caused by plant construction and operation; and (6) adaptability of the site for commercial plant location. If a specific plant site is known, the above information should be given in sufficient detail, with appropriate maps and charts, to allow the assessment of the potential impacts of the proposed activity on the natural and socioeconomic environment surrounding the plant site. The emphasis should be on the expected rate of release of known toxic substances or environmental pollutants, the magnitude and duration of socioeconomic impacts, and the commitment of resources.

1.3.3.2 Initial characterization of the existing environment likely to be affected by operation and construction of the proposed plant. The Offeror should identify the site of the proposed demonstration facility by state, county, township, latitude, and longitude. If the Offeror has not selected a single site, the prime candidate sites should be identified as above. The Offeror should discuss how the sites (or site) conform(s) to the criteria established in Sect. 1.3.3.1.

A brief overview of the environmental features of the selected plant site (or candidate sites) and its surrounding environment, both natural and socioeconomic, which are likely to be impacted by the proposed plant construction and operation should be given. The description should include sufficient detail to allow a preliminary assessment of probable environmental impacts.

1.3.3.3 Inventory of potential environmental impacts from the proposed action. The Offeror should analyze the probable environmental impacts of the proposed activity with emphasis on the analysis of Federal, state, and local environmental issues. Foreseeable potential environmental and socioeconomic impacts, both direct and indirect, of plant construction and operation should be evaluated. The description should evaluate the magnitude and importance of both beneficial and detrimental effects caused by the proposed action and identify the time periods in which these effects are anticipated. Potential environmental impacts that cannot currently be quantified should be identified. The extent to which the proposal will conform or conflict with any applicable Federal, state, or local statutes, regulations, standards, limitations, and policies relating to environmental quality (air and water quality, endangered species, etc.) should be clearly stated (Sect. 1.3.3.9). In addition, the Offeror should assess the risks of environmental destruction from accidental discharges, fugitive emissions, and the sudden withholding or addition of effluents to receiving bodies.

1.3.3.4 Measures for mitigation of potential environmental impacts. Measures to be taken during design, construction, and operation of the proposed facility to eliminate, reduce, or compensate for impacts on the environment should be described. Consideration should extend, if applicable, to solid waste disposal, including landfill and revegetation, construction of holding ponds, elimination of hazardous or nuisance gaseous pollutants, biodegradability of organic effluents in holding ponds, disposal of sludge and recycling of wastewater, and control of all other effluents which may cause environmental impacts. The degree of confidence in the control of potentially polluting process emissions should be discussed and justified, including whether or not current technology or practice affords the desired degree of protection for all aspects of emission control during plant construction and operation. Plans to eliminate or to alleviate adverse demographic and socioeconomic effects of demonstration plant construction and operation should be given. The Offeror should also include plans for providing a public information distribution system and a public forum for dissemination and discussion of proposed plans and activities to allow public involvement at an early stage in plant design, siting, and operation.

1.3.3.5 Unavoidable adverse environmental impacts. The Offeror should summarize those adverse environmental impacts and risks, identified in Sects. 1.3.3.3 and 1.3.3.4, that cannot be avoided should the proposed action be implemented. The magnitude and importance of each impact should be assessed.

1.3.3.6 Irreversible and irretrievable commitment of resources. The Offeror should summarize, from the survey of adverse environmental impacts given above, the extent to which the proposed action would consume, destroy, or transform scarce or nonrenewable resources. This discussion should include both natural and cultural resources.

1.3.3.7 The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. The Offeror should identify the extent to which the proposed action would constrain the diversity and range of potential uses of the environment over the long term. The Offeror should consider the present condition of the plant site (if known) and the surrounding natural and cultural environment as well as the long-term uses of the resources that would be committed by the proposed activity.

1.3.3.8 Uncertainties and unresolved environmental issues. The Offeror should identify and describe those areas where lack of information or understanding restrict accurate prediction of environmental impact. This discussion should include any uncertain aspects of facility design, site, and effluent character as well as any uncertainties about legal requirements.

1.3.3.9 Legal requirements affecting fossil energy conversion offerors. Offerors shall demonstrate in their proposal their ability to meet the requirements of all applicable local, state, and Federal statutes in addition to the regulations and guidelines issued pursuant to these laws. The following is a selected list of Federal laws and their amendments which should be considered:

- Federal Water Pollution Control Act Amendments of 1972, PL 92-500;
- Occupational Safety and Health Act of 1970, PL 91-596;
- Clean Air Act Amendments of 1970, PL 91-604;
- Clean Air Act Amendments of 1977, PL 95-95;
- Endangered Species Act of 1973, as amended, PL 93-205, PL 94-32, and PL 94-359;
- National Environmental Policy Act of 1969, PL 94-52 and PL 94-83;
- Toxic Substances Control Act of 1976, PL 94-469;
- Noise Control Act of 1972, as amended, PL 92-574 and PL 94-301;
- Federal Environmental Pesticide Control Act of 1972, as amended, PL 94-51 and PL 94-140; and
- Resource Conservation and Recovery Act of 1976, PL 94-580.

1.3.3.10 Work plan and schedule for Environmental Report. The Offeror should provide a preliminary outline of the baseline environmental data collection program for the ER that will be initiated prior to plant construction. The Offeror should also indicate which personnel will perform this work, whether in-house or consultants, and their qualifications. Further, the schedule and anticipated completion date should be reported.

2. GENERAL REQUIREMENTS FOR ENVIRONMENTAL REPORTS FOR FOSSIL ENERGY DEMONSTRATION PLANTS

2.1 Introduction

The Contractor will be required to plan and implement a monitoring program to collect baseline data and to assess the beneficial and adverse environmental and socioeconomic impacts of constructing and operating the proposed facility. This information will be submitted to DOE in the form of an ER with sufficient detail so that DOE can fulfill its requirements under NEPA [Sect. 102(2)c] to prepare an Environmental Impact Statement (EIS). Many of the details of the baseline survey will be established by DOE in conjunction with the Contractor. The general ER requirements are described in the following sections, and more detailed information on preconstruction monitoring is available in *Environmental Monitoring Handbook for Coal Conversion Facilities*, ORNL-5319. It should be emphasized that because of the need to demonstrate environmental acceptability, it will be necessary to expend a greater effort in monitoring and ER development than the minimum normally required to obtain permits and licenses.

2.2 Summary

This section should summarize concisely the salient information and factual conclusions of the other sections. Emphasis should be on any unresolved environmental issues and on factual conclusions concerning the significance of the impacts associated with the proposed plant and the relative merits of alternatives.

2.3 Description of Proposed Action

All planned or proposed activities for the project should be discussed. Considerations should not be limited to those activities funded by DOE. Plans for assuring public participation in the early stages of project development should be described.

2.3.1 Site locations and description

2.3.1.1 Specification of location. The site location should be specified by latitude and longitude of the major structure to the nearest second, and by the Universal Transverse Mercator Coordinates (Zone Number, Northing, and Easting as found on USGS topographical maps) to the nearest 100 m. The state, county, and other political subdivisions in which the site is located should be identified as well as the location of the site with respect to prominant natural and man-made features such as rivers, lakes, and cities.

2.3.1.2 Site area. Maps of the proposed site should be included which show clearly the following:

1. the plant property lines;
2. the plant site boundary lines, if these are different from the property lines;
3. the plant site contours in sufficient detail to allow topographical features to be discerned;
4. the location and orientation of the major structures;
5. the location of any industrial, commercial, recreational, or residential structures within the site boundary;
6. a scale that will permit the measurement of distances with reasonable accuracy;
7. true north; and
8. highways, railways, and waterways that traverse or are proximate to the site.

2.3.2 Facility description

The proposed demonstration facility layout should be illustrated and related to site maps (Sect. 2.3.1). A description of the proposed facilities and systems should be sufficient to assess the potential environmental impact of land commitment; utility corridors; holding ponds; water intakes and discharges; ash/slag disposal areas; storage areas for coal, sultur, products, and by-products; and auxiliary facilities such as electric stations, oxygen production facilities, and sulfur recovery plants. This description should be referenced in the presentation of mitigation procedures (Sect. 2.3.11).

2.3.3 Site preparation and construction activities

The description of site preparation and construction activities should include equipment to be used, construction procedures, temporary roads, clearing and filling methods, dewatering of excavations, and location of temporary structures. An estimate of the work force schedule and of the time required for each stage should be provided. The proposed work effort described here should be coordinated with the mitigations described in Sect. 2.3.11.

2.3.4 Effluents

A detailed engineering evaluation is necessary to describe the effluents properly. This evaluation will lead to the best possible estimate of the chemical and physical properties of effluents. Each source of potential emissions from the plant, including fugitive emissions, should be characterized completely, including gaseous emissions, liquid effluents, and solid waste, for known toxic organic compounds and trace elements, all regulated pollutants, heat, and odor and taste contaminants. This effluent characterization should be updated regularly as the engineering design becomes finalized or as more information is provided by laboratory experiments or pilot plants. The expected noise levels and visual impacts should also be evaluated.

At the present stage of development of fossil fuel conversion technologies, it is not always possible to identify in detail all the parameters and compounds that should be monitored to assess the potential impact of plant operation on the surrounding environment. Therefore, DOE will assume responsibility in delineating which potentially toxic compounds and effluent parameters should be monitored for any given fossil fuel technology. The compounds to be identified by DOE may include some for which no current monitoring or sampling requirements exist under EPA and state regulations that apply to the particular type of facility. DOE will identify these compounds and effluent parameters to be monitored primarily on the basis of the following three criteria:

1. compounds or effluent parameters having toxic or potentially toxic characteristics;

2. effluent parameters whose measurements are necessary for the design of appropriate environmental control equipment; and

3. effluent parameters that must be controlled to allow process water recycle.

DOE will define what these additional compounds and parameters are, with what frequencies they are to be monitored, and which analytical methods are to be used. As research continues on effluent characterization, effluent composition stability, and effluent interaction with terrestrial and aquatic biota, the DOE list of substances and parameters to be monitored will be augmented and revised from the best available research information. This revision process will be continual as these technologies evolve, and the Contractor should be prepared to respond to monitoring program changes.

Baseline monitoring should be conducted for compounds or elements that are toxic and biologically accessible. The expected rate of release and concentration of each toxic or hazardous contaminant at the discharge point should be given. All potentially hazardous emissions should be identified by their physical and chemical form. Nominal, maximum, and minimum release data during any 24-hr period as well as annual loading

rates to receiving environments should be given also. Attention should be given to regulated emissions, as compliance may be judged on the basis of 1-hr, 3-hr, or 8-hr time periods.

Furthermore, an estimate, either by direct determination or by extrapolation from molecular configuration, should be made of the water and lipid solubilities of the toxic effluents as given above. References to specific documents or sources that detail such effluents should be made, and appropriate tables, charts, graphs, etc., should be included (with explicit source references); these documents should be made available to DOE on request.

Based on environmental transport modeling, major dispersion patterns of pollutants in the environment surrounding the facility should be given (see Sect. 2.3.5). These should be related to a site map as described in Sect. 2.3.1.

Information on the likelihood of sudden withholding or addition of effluents such as heat to receiving waters, flow changes of aqueous effluents, or operation of diversion or intake structures that would modify water quality parameters in receiving waters should be provided.

The Contractor should assess the lack of information on effluent quantity and composition with respect to the most recent plant design and process stream flow. The Contractor should also assess the hazards of handling and storing products and by-products onsite.

2.3.5 Environmental transport of pollutants

The Contractor should provide evaluations of atmospheric and aqueous dispersion of pollutants (including physiochemical and biological transformation), using environmental transport models to estimate possible air and water quality degradation near the plant site. The Contractor should justify air and water quality values based on environmental transport models, ambient background data, and compliance with all Federal, state, and local statutes, regulations, standards, limitations, and policies respecting environmental quality. The following selected Federal laws and any subsequent amendments are of special importance:

- Federal Water Pollution Control Act Amendments of 1972, PL 92-500;
- Occupational Safety and Health Act of 1970, PL 91-596;
- Clean Air Act Amendments of 1970, PL 91-604;
- Clean Air Act Amendments of 1977, PL 95-95;
- Endangered Species Act of 1973, as amended, PL 93-205, PL 94-32, and PL 94-359;

- National Environmental Policy Act of 1969, PL 94-52 and PL 94-83;
- Toxic Substances Control Act of 1976, PL 94-469;
- Noise Control Act of 1972, as amended, PL 92-574 and PL 94-301;
- Federal Environmental Pesticide Control Act of 1972, as amended, PL 94-51 and PL 94-140; and
- Resource Conservation and Recovery Act of 1976, PL 94-580.

2.3.6 Mass balance of toxic trace elements

A mass balance for toxic trace elements found within the raw material used in the conversion process should be estimated for the plant as a whole unit and should be presented in terms of solid, liquid, or gaseous effluents.

2.3.7 Toxic materials in products

Toxic materials present in products of the plant should be identified, including any hazards in handling and storing onsite.

2.3.8 Water use

The water balance in the plant should be estimated, including the amount of water supplied to the plant, sources of water, and points of water release and production within the plant. The effect of consumptive water use by the plant on water supplies for the surrounding region should be described.

2.3.9 Solid waste

Solid waste generated by the proposed facility should be quantified and the chemical and physical properties of each solid waste characterized. Environmental hazards such as flammability, leaching properties — especially of the toxic trace elements and toxic hydrocarbons discussed in Sect. 2.3.4 — gas production, dust generation, and vermin attraction should be discussed.

The solid waste handling and disposal system, including all intermediate operations occurring between the source and point of ultimate disposal, that is, storage, dewatering, transfer, chemical treatment, and transportation, should be described. The wastes should be traced to their ultimate disposal, even if offsite. Mitigative measures taken to minimize surface and groundwater contamination and unsightliness should be described in Sect. 2.3.11.

The implications of the Resource Conservation and Recovery Act of 1976, relative to solid waste handling and disposal should be discussed.

2.3.10 Accidents

This section should assess the potential for accidents, expressed in terms of probability of occurrence and magnitude of environmental consequences.

Explicit plans to control the effects of credible accidents or natural occurrences that could cause excessive and unexpected release of effluents should be presented with maximum release or damage estimates. The Contractor should demonstrate compliance with Federal spill prevention, containment, and control plans, and with any other Federal, state, and local regulations pertaining to industrial accidents involving the release of fossil fuels, their derivatives, and wastes. Communication networks with municipal fire and police protection units and with other industrial facilities should be described.

Detailed regulations for worker safety and exposure to potentially harmful substances are being developed. Regulations have recently been proposed for coal gasification plants (M. L. Cohen, *Recommended Health and Safety Guidelines for Coal Gasification Pilot Plants*, approved for publication, NIOSH, December 12, 1977). The Contractor should identify the regulations that are applicable and describe compliance plans.

2.3.11 Mitigation

Measures to be taken in the design and during construction and operation to mitigate impacts on the environment should be described. Typical examples include reductions of noise and odor emissions, watering of roads to minimize dust, control of excavation dewatering, control of thermal discharges, control of gaseous and liquid emissions, control of particulates, and control of other pollutants discussed in Sect. 2.3.4 as toxic emissions. All applicable waste disposal methods, including landfill and revegetation, construction of holding ponds to minimize discharge of aqueous pollutants, facilities for biodegradation of organic effluents, disposal of sludge, recycling of waste water, etc., should also be discussed.

Socioeconomic impact mitigation procedures should be presented, including at least the timing and availability of revenues to provide required social services, alleviation of any potential transportation bottlenecks produced or aggravated by the proposed activity, and procedures by which future housing needs of the plant work force and their families can be met (Sect. 2.4.7).

2.4 A Characterization of the Existing Environment Likely to be Affected by the Proposed Action

2.4.1 Uses of adjacent lands and waters

The information in this section should demonstrate coordination of the principal activities of the proposed project with the uses of land and water in the area. Potential constraints or enhancement of public access to land and water for any present purpose should be identified. Discussion should include required offsite access corridors, including new roadways, rights-of-way for water conveyance, power lines, and other features relating to the facility as well as reference to the reservation of rights-of-way for future expansions.

A map or maps, such as described in Sect. 2.3.1, should show the locations of the following: (1) water bodies, wetlands, wooded areas, grasslands, agricultural lands, and other physiographic features; (2) developed areas; (3) national, regional, or local parks; (4) dedicated areas; (5) other public facilities; (6) natural areas; (7) cultural resources of the area including archaeological, paleontological, and scenic sites; and (8) all national landmarks, historical sites, and natural and cultural areas. Area estimates of each type and subtype should accompany the map. The total acreage owned by the Contractor and that part to be occupied or modified by the proposed project should be indicated.

For an area that might reasonably be expected to experience impacts from the proposed project, the nature and extent of present and projected land use (agricultural, commercial, livestock raising, residences, wildlife preserves, sanctuaries, hunting, recreation, industries, transportation, etc.) should be indicated. If the plant site and adjoining areas are zoned for specific uses, the zoning restrictions both at the site and in the projected areas of impact should be discussed, and contacts with local and other zoning commissions should be indicated.

The nature and amounts of present surface and groundwater use (water supplies, irrigation, reservoirs, recreation, etc.) within the plant boundary and that area which may experience impacts from plant operations should also be indicated.

2.4.2 Background levels of potentially toxic substances

It is essential that the Contractor determine the existing environmental background levels of potentially toxic substances that will be emitted as a result of plant operation. Air, water, soil, sediment, and animal and plant tissue quality baseline data, such as those discussed in Sects. 2.4.3 to 2.4.6, should be gathered for those contaminants identified by DOE or required by other Federal, state, or local regulations. Selection of the compounds or elements to be analyzed will depend on the type of tissue, the environment from which it is collected,

and the toxic contaminants discussed in Sect. 2.3.4. DOE will assume responsibility for determining which contaminants will be monitored in each tissue type.

Preconstruction sampling should be conducted for a period of at least one year to define seasonal variation unless otherwise stipulated by DOE, as discussed in Sect. 2.4.3. Sampling should be most intensive during those seasonal periods judged to be environmentally the most critical for environmental transport of possible pollutants or where additive effects with existing contaminants might be greatest. In addition, sampling duration and frequency should correspond to requirements of Federal, state, and local authorities for time-dependent pollutant concentration regulations. Baseline data should include a description of or reference to the methods used for each analysis, the number of samples taken, the sampling dates, and the location of each sample. Sampling locations should be selected to supply data for dispersion model calibrations, be referenced to a map such as that described in Sect. 2.3.1, and include supplemental information such as height above ground, depth in water, etc., where necessary. The best available analytical procedures should be used. More detailed information on sampling strategies and analytical procedures is available in the *Environmental Monitoring Handbook for Coal Conversion Facilities*, ORNL-5319.

2.4.3 Ecology

The food web is a useful tool for the analysis of ecological processes, especially those involving structural and functional considerations. Use of the concept in monitoring programs is justified by its pragmatic utility in resource management, which should operate on a systems basis to be effective. Reference to a conceptual food-web model during monitoring program development and implementation will allow integration of the baseline monitoring effort among the essential biological components and habitat features of the aquatic and terrestrial receiving system.

A flora and fauna association map for the principal naturally occurring organisms at the proposed plant site and for those areas that might reasonably be expected to experience impacts from the project should be provided. The total acreage of each plant community should be included along with the area of each that will be disturbed by the project. The conceptual food-web model should be detailed.

An environmental assessment would be more accurate if based on a total ecosystem description, although a description of all components of an ecosystem and their interactions is not normally feasible. However, every attempt should be made to place the biological component descriptions in an ecosystem context. Abundance, spatial distribution, and habitat requirements should be described for species that are important for one of the following reasons:

1. The species is commercially or recreationally valuable.

2. The species is listed as threatened or endangered by the Federal government or the state in which the project is located (such species should be tabulated separately with its habitat requirements and probable reasons for decline).

3. The species is known to affect the well-being of some important species within criteria (1) or (2) above.

4. The species or taxonomic group is a dominant functional component of the ecological system.

5. The species will be used as an indicator species — that is, those species that can provide important information on the bioaccumulation of toxic substances within or near the proposed project site, as discussed in the following sections.

Critical biotic parameters such as breeding times, breeding areas, and mass concentrations during migration periods should be delineated. Unusual natural plant and animal communities should be emphasized, especially if they are being considered for preservation within natural wildlife areas. Areas of occurrence of endangered or threatened species should be clearly indicated, including the portions of their habitats that will be disturbed by the project.

All known preexisting environmental stress from man-made disturbances or from recent natural catastrophes such as infestations, epidemics, or unusual weather events that have had or are producing significant impacts should be identified and discussed.

Baseline sampling for biotic constituents must be done for a period of at least one year. To allow for initial activity toward development of an EIS, DOE may in some cases allow the Contractor to submit an initial evaluation of environmental impact based on an analysis of at least six months of field data related to the proposed facility. The six months of field data should fully document the critical life stages and biologically significant activities (e.g., spawning, nesting, migration) that increase the vulnerability of the potentially affected biota at the proposed site; in addition, the ER should contain projections of the remaining seasonal periods. If this is allowed, the applicant must also furnish, within six months of the time of filing, a final evaluation that will include the full year of field data. The expected schedule for final EIS issuance, as discussed in the Foreword, will require approximately six to nine months from receipt of an acceptable ER containing one full year of ecological data. Thus, the above timing for biological sampling will permit a full year of data to be assessed before issuance of the final EIS and should cause no delays in the construction schedule. A second contiguous year of sampling that will allow annual variations to be discerned should be carried out if the construction schedule provides an opportunity to do so. This should be coordinated with DOE.

To allow a complete understanding of the quality of data collected, a thorough and comprehensive description of the baseline environmental data collection program should be given, including all pertinent information on sampling design, sampling frequency, statistical methodology and validity, sample analysis procedure, and instrument reliability (especially for automated sampling systems).

Freeze-dried tissue samples of important species should be stored for future analysis in the event of unforeseen baseline data needs.

2.4.3.1 Aquatic biota quality. Important (as defined above) or sensitive aquatic species should be identified for the receiving and potentially impacted water bodies. Their tissues should be analyzed for toxic trace elements and potentially toxic hydrocarbon accumulations as discussed in Sect. 2.3.4. These species should include representatives from the microplankton, fish, and invertebrate communities and the dominant detritivore and forage species because they are best suited to monitor bioaccumulation and food chain magnification of the potentially toxic compounds discussed in Sect. 2.3.4. Those species used for human consumption should be analyzed for their aesthetic qualities such as taste and odor.

2.4.3.2 Terrestrial vegetation quality. The presence, distribution, and abundance of particularly sensitive or important (as defined above) plant species occurring on and about the site should be identified. These should include representatives of the dominant vegetation types, important forage species for naturally occurring herbivores, and agricultural crops. Information should be provided on reproductive success, seed viability, and basal area of trees as well as general plant population appearance, including lesions, spotting, or discoloration, which can indicate existing stresses such as atmospheric or soil contaminants or biotic agents (i.e., insects and diseases).

Plant tissue from the above species should be analyzed for toxic element concentration and appropriate organic contaminants, as discussed in Sect. 2.3.4. The best available methodology should be used to determine particulate accumulation on leaf surfaces near the demonstration facility site. These samples should be analyzed for those toxic elements and potentially toxic hydrocarbons discussed in Sect. 2.3.4.

2.4.3.3 Terrestrial vertebrate population quality. The Contractor should identify those small mammals or other vertebrates that are important herbivores, are food resources for important carnivores (especially those that are endangered or threatened), or are consumed by man (game species). The distributions and abundances of these species should be delineated where possible, and tissue analyses of these species should be performed for those contaminants discussed in Sect. 2.3.4.

2.4.4 Air quality and meteorology

Ambient air quality data should be collected for those contaminants for which Federal, state, or local standards exist (Sect. 2.3.5) and for the appropriate time periods designated by those agencies. Such data on other potential contaminants as designated by DOE and for which no standards presently exist may also be required, as discussed in Sect. 2.3.4. Sampling frequency should be sufficient (at least monthly) so that any seasonal or monthly period that may be environmentally critical for pollutant dispersion can be identified. If such environmentally critical periods are known (e.g., normal inversion periods), sampling should be more intense during those times.

Meteorological data may initially come from a nearby national weather service data source judged to be climatically representative of the area and should include at least five years of observations. One year of data should come from a meteorological station at the plant site, and rainfall collected at the plant site should be analyzed for at least a one-year period for pH, total acidity, sulfur compounds, ammonia, nitrogen oxides, toxic hydrocarbons, and toxic trace elements, as discussed in Sect. 2.3.4. Sampling intervals should be commensurate with the stability of the parameter being measured. Similar data, if available, from an appropriate national weather service station should be presented for the previous five years.

Ambient noise levels should be measured at the plant boundaries and at any dwelling or facility within one mile of the site.

2.4.5 Hydrology and water quality

Hydrologic and water quality data should be provided for those waters that will serve as water supplies or as receiving bodies for routine or accidental releases which will receive atmospheric deposition directly or via runoff from plant activities, or which will be affected by runoff from the plant site and its immediate surroundings. Drainage patterns of the plant site should be shown on a map similar to that described in Sect. 2.3.1. Information relating to water and sediment characteristics should include measurements on or in close proximity to the plant site and to proposed liquid and solid waste disposal sites.

Quantitative measurements of parameters related to surface-water hydrology, groundwater hydrology, and the location and extent of subsurface aquifers should be given. The descriptions should include typical seasonal ranges and averages, and historical lows and highs. These water bodies should be analyzed in the manner described in Sect. 2.3.4 for the following: (1) pH; (2) temperature; (3) dissolved oxygen; (4) calcium, magnesium, and total hardness; (5) total nitrogen; (6) ammonia; (7) nitrate; (8) nitrite; (9) total phosphorus; (10) total particulate carbon; (11) dissolved organic carbon; and (12) potentially toxic trace elements, both particulate and dissolved. Dissolved and particulate organic carbon should be analyzed for potentially hazardous hydrocarbons,

as indicated in Sect. 2.3.4, and wherever possible the ionic species of the contaminants should be delineated.

Suspended and bottom sediments in the above mentioned water bodies should be analyzed for toxic trace elements and prior accumulation of potentially toxic hydrocarbons (Sect. 2.3.4) which may be released from the plant. Whenever possible, the ionic species of the contaminants should be identified. Interstitial sediment water should also be analyzed for dissolved oxygen, pH, and redox potential.

2.4.6 Geology and soil quality

A description of the geology of the site and its surroundings should be provided, including information about the topography, stratigraphy, and major soil and rock types of the area. The level of detail presented should be appropriate to the proposed plant and particularly to the waste disposal system. For example, if ash ponds are to be constructed, a detailed description of the soil, bedrock, and groundwater hydrology at the proposed pond site should be provided.

The soils on the plant site and in the surrounding area that will be affected by plant activities, especially atmospheric deposition, should be analyzed for toxic trace element composition and toxic organic contaminants such as discussed in Sect. 2.3.4.

2.4.7 Socioeconomic

The socioeconomic impacts of plant construction and operation are determined both by the nature of the plant and by the characteristics of the community where it is located. For the human population within 10 miles of the plant site, the following areas of potential socioeconomic impact must be considered.

2.4.7.1 Economic base. A description of major sources of personal income in the local communities and of the proportion dependent on each source should be presented. Major employers and numbers of employees should be identified. Information on the size and organization of the local construction industry should be provided. Descriptions of personal and regional income levels, of unemployment levels, and of future outlooks should be given.

Estimates of the number of workers who will move into the area during construction and operation of the plant should be made. This information should be based on comparisons of the number of employees with specific skills needed to the number already available in the area. The time frame in which these workers will be needed and how long they will stay should be given. Expected expenditures in the region on materials, services, and labor should be described. Secondary impacts (multiplier effects) of expenditures by the Contractor and work force within the region should be discussed.

2.4.7.2 Demography/settlement patterns. A brief history of the area within 10 miles of the plant site in terms of its rate of population growth and rural-urban-farm-nonfarm character should be provided. Population forecasts made by local, state, or Federal planners, or others should be given. Forecasts of population changes without the plant development should be compared to forecasts of population changes with the plant development, including the expected population size and distribution during both the construction and operation phases.

The characteristics of the present (before the project) population of the area should be identified in terms of age, sex, ethnicity or race, income, occupation, and special cultural and social traits. The expected composition of the plant work force likely to move into the area should also be discussed. If the characteristics of the work force will be very different from those of the present population, potential areas of social and political conflict should be considered.

2.4.7.3 Political and social structure. Political jurisdictions and tax districts at regional, county, and municipal levels should be identified. Planning and administrative capabilities should be discussed. Any official plans concerning land use and zoning that are relevant to population growth, housing, and changes in land use patterns should be described. Potential conflicts between project-related land use and existing uses or plans for future use should be identified.

Probable project-related changes in those characteristics of the community important to local residents should be described. Information gathered from interviewing local officials and residents and from analyzing the content of local newspapers, radio broadcasts, or civic meetings may help the Contractor to identify issues of particular importance to a given community. Significant groups in the community such as occupational, professional, and special interest groups should be identified in order to specify who will benefit and who will be adversely affected by the project.

2.4.7.4 Dislocation and disruption of social and economic activity. Residences, businesses, institutions, recreational facilities, and any other social or economic activity that will be physically dislocated or disrupted by the use of the site or by construction work should be identified.

2.4.7.5 Impacts on historic, cultural, and natural features. Any direct physical impacts or indirect effects on public access to or enjoyment of historic, cultural, or natural features should be identified.

2.4.7.6 Housing. Housing sales and rental markets should be discussed in terms of the number of units, turnover and vacancy rates, adequacy of structures, construction, trends, and location of existing and projected housing. The availability of particular types of housing such as mobile homes and short-term rental units and the constraints on housing availability, such as water and sewer capacity and zoning restrictions, should be discussed. The potential for inflationary impacts on rentals and prices should be estimated.

2.4.7.7. Public services. Public services to be discussed include water, sewerage, trash pickup and disposal, roads and other transportation systems, police and fire protection, schools, health and welfare systems, and recreational and cultural facilities. For each of these public services, current capacities and projected needs with and without project development should be given. The responsible agencies and the sources of revenue for each of these services should be identified. The ability of each service system to absorb plant-related population increases should be evaluated. Planning mechanisms and lead times for any needed increases in capacities should also be discussed.

The condition and carrying capacity of roads, highways, and other transportation systems should be described. Any potential bottlenecks such as bridges, commuting routes, or narrow roads in the vicinity of the site should be identified.

For health care, the current number of hospital beds, physicians, and specialized medical facilities per capita should be given.

2.4.7.8 Taxation. Present tax structures, rates, policies, and bases should be evaluated for their effects on the ability of local jurisdictions to increase delivery of needed services and for their effects on the level and timing of payments from the demonstration facility to the local area. Comparisons should be made between expected tax revenues and the funding required for adequate levels of public services.

2.5 Potential Environmental Impacts of the Proposed Action

This section should analyze the foreseeable potential environmental and socioeconomic impacts, both direct and indirect, of (1) site preparation, (2) plant construction, (3) plant operation, and (4) plant shutdown. In so doing, it should describe those effects on the environment, beneficial as well as adverse, which could be caused by the proposed plant and its alternatives, evaluate the magnitude and importance of each such effect, and identify the time frames in which these effects are anticipated. Particular attention should be given to the impacts of those parameters identified in the baseline monitoring program. Effluents or plant activities for which the environmental impacts are unknown at the time of ER preparation should be identified.

The indirect or "secondary" consequences refer primarily to associated socioeconomic impacts such as investments and changed patterns of social and economic activities likely to be induced by the proposed action or its alternatives. Such secondary effects, through their impacts on existing community facilities and activities, may be more substantial than the primary effects of the proposed action.

2.5.1 Site preparation and plant construction

The Contractor should organize the discussion in terms of the effects of site preparation and plant construction on land use, water use, and the local economy and social structure. The adverse consequences to both human and wildlife populations should be considered and identified as either (1) unavoidable but subject to later amelioration or (2) unavoidable and irreversible. The measures to be taken to mitigate all adverse impacts should be delineated.

In the land use discussion, disturbances to existing terrain and wildlife habitats by construction activities, such as creating building material supply areas; building temporary or permanent roads, bridges, or service lines; disposing of trash and chemical wastes (including oil); excavating; and land filling, should be described. The proximity of human populations should be indicated and identification made of the undesirable impacts on their environment arising from noise and from inconvenience due to the movement of men, material, and machines, including activities associated with any provision of housing, transportation, and educational facilities for workers and their families.

An annual schedule of the estimated work force to be involved in site preparation and plant construction should be presented. Any expected changes in accessibility of historical, cultural, and archaeological sites and natural landmarks in the region should be described.

The discussion should also include any effects of site preparation and plant construction activities whose consequences may be beneficial to the region as, for example, the use of spoil to create playgrounds and/or recreational facilities. The discussion of water use should include the impact of site preparation and construction activities on surface-water and groundwater hydrology. The overall plan for protection of water resources (recreation, reservoir, etc.) that may be affected by plant construction should be discussed. The Contractor should describe the effects of these activities on navigation, fish and wildlife resources, water quality, water supply, and aesthetics.

Where it is proposed to create a reservoir, the effects on the local ecology, including the loss of flora and local migration of fauna from the area the reservoir will occupy, should be described. In addition, the expected establishment and development of aquatic plant and animal life should be considered. This discussion should reference any available data based on studies of similarly sited reservoirs.

The effects of clearing and installing offsite access routes, such as roads, transmission lines, or pipelines, on the environs and on the people living in or traveling through the adjacent area should be discussed. The following topics will serve as guidelines for this discussion, but the applicant should include any additional relevant material:

1. the proposed techniques for clearing access for the offsite routes and any resulting temporary and permanent changes that will be

induced in the physical and biological processes of plant and wildlife through changes in the hydrology, topography, or ground cover or the use of growth retardants, chemicals, biocides, sprays, etc., during clearing, construction, and installation of these facilities;

2. the methods to be used in constructing the offsite facilities, including related environmental effects;

3. the number and length of new access and service roads required, if any;

4. the erosion directly traceable to construction activities;

5. the loss of agricultural productivity and other present uses of areas to be affected by offsite facilities; and

6. the effects of construction on identified endangered species.

In addition to the discussion of the effects of site preparation and construction, the Contractor should furnish details of the site-related environmental quality control program with which he plans to monitor these activities (see Part 3 of this document). The Contractor should describe his control programs and the procedures he intends to follow as a means of implementing adherence to applicable environmental quality control limits.

Precautions for handling of fuels, lubricants, oily wastes, and other chemical wastes should be included. Procedures for disposal of slash and unsaleable timber and for cleanup and restoration of areas affected by clearing and construction activities should be described. Any other measures planned for protection of fish and wildlife during construction should also be described.

2.5.2 Plant operation

The impacts of operating the proposed facility should be quantified. In the discussion of each impact, the Contractor should make clear whether the supporting evidence is based on theoretical, laboratory, onsite, or field studies undertaken on this or on previous occasions. The source of each impact, such as the plant subsystem, waste effluent, and the population or resource affected should be made clear in each case. The impacts should be distinguished in terms of their effects on surface water bodies, groundwater, air, and land.

The Contractor should describe the impacts of operating ash/slag disposal areas. This description should include consideration of impacts on groundwater, surface water, air (dusting), and land use. Alternative methods of solid waste disposal should be assessed to provide a complete environmental analysis for ensuring that solid waste generated through plant operation will be handled in an environmentally acceptable manner.

The Contractor should describe the effects, if any, that released waste heat may have on the aquatic environment of receiving waters, and compliance with applicable guidelines and thermal standards or limitations should be indicated. The effect that any heated effluent will have on the temperature of the receiving body should be predicted, and any studies or calculations performed to determine these changes should be described. The resultant expected impacts on the aquatic biota should be discussed, while expected thermal effects should be related to the optimum and tolerance temperature ranges for the aquatic species sampled and the food base that supports them.

Potential hazards of water intake and discharge structures to fish species and food base organisms should be identified. If applicable, the Contractor should discuss the potential biological effects of modifying the natural circulation of the water body. The effect of water consumption by the plant should be given, including any predicted changes in temperature, nutrient concentration, oxygen levels, suspended sediment load, or salinity changes resulting from water withdrawals.

The specific concentrations of chemical and biocide effluents at the points of discharge into receiving waters should be compared with natural ambient concentrations, with allowable release concentrations under applicable effluent limitations, and with applicable water quality standards. Dilution and mixing of discharges into the receiving waters should be discussed in detail, and estimates of concentrations of important chemical contaminants at various distances from the point of discharge should be provided. These estimates should include the effect of water flow variations such as the average seven-day once-in-ten-years low flow, the lowest control flow, and the lowest recorded minimum for the receiving water body. A description of the method of calculation should be provided. In addition, the Contractor should discuss possible synergistic effects associated with temperature changes on chemical and physical interactions.

The effects on terrestrial and aquatic environments from chemical wastes that contaminate surface water or groundwater should be described. The potential for the bioaccumulations in aquatic habitats of the toxic substances discussed in Sect. 2.3.4 which lead to man or which affect endangered, threatened, or protected species should be discussed. Any anticipated chemical or biocide contamination of domestic water supplies should be discussed, especially for those toxic contaminants identified in Sect. 2.3.4. The effects on the environment of chemicals in blowdown and drift streams should also be considered.

The Contractor should discuss the possible effects of plant shutdown or of other temporary plant operating conditions on the aquatic biota that have become dependent upon normal plant activities, especially with regard to thermal shock and water chemistry changes.

Any discharges of sanitary wastes into receiving waters should be discussed and compared with appropriate effluent guidelines and applicable water quality standards.

Expected impacts on terrestrial biota resulting from atmospheric pollutants should be discussed. These impacts include effects resulting from changes in ambient air concentrations of important toxic constituents and predicted impacts from particulate deposition of toxic trace contaminants, both organic and inorganic, on leaf surfaces or soil. Impacts should be evaluated for both the receiving vegetation and for the herbivores that utilize them for food. The potential for the bioaccumulations in terrestrial species of toxic substances discussed in Sect. 2.3.4 which lead to man or which affect endangered, threatened, or protected species should again be thoroughly considered.

Toxic substances (discussed in Sect. 2.3.4) for which the environmental impacts are unknown at the time of ER preparation should be enumerated separately from those whose magnitude or importance can be predicted.

Consideration should be given to health effects — both on the community and on plant workers. Because proposed coal conversion plants will employ state-of-the-art control equipment, all routine plant effluents are expected to be in compliance with current and anticipated standards. Therefore, health effects on the community should be minor. Plans for industrial hygiene procedures to protect plant workers should be addressed because some degree of exposure to hazardous materials may occur as a result of routine, fugitive, or accidental emissions and routine or nonroutine maintenance. The Contractor should present plans for compliance with applicable NIOSH guidelines (e.g., *Recommended Health and Safety Guidelines for Coal Gasification Pilot Plants*, approved for publication, December 12, 1977).

The environmental effects of operation and maintenance of access for offsite facilities, such as transmission lines, pipelines, and roads, should be evaluated. The evaluation of effects should make clear the Contractor's plans for maintenance of these access routes. Plans for use of herbicides, pesticides, road deicers, etc., should indicate types, volume, concentrations, and manner and frequency of use. References to authoritative guidelines assuring that the applicant's procedures are acceptable should be included. Resulting effects on plant life, wildlife habitat, land resources, and scenic values should also be evaluated.

The Contractor should discuss significant benefits that may be realized from the operation of the proposed station. Where the benefits can be expressed in monetary terms, they should be discounted to present worth. Deferred benefits that may be of social or institutional significance should be noted. In each instance where a particular benefit is discussed, the Contractor should indicate who is likely to be affected and for how long. To assess aesthetic impacts, the Contractor should provide illustrations of significant plant structures or environmental modifications visible to the public. Parks or other recreational facilities on the site that will be available for public use should be described.

Social and economic costs and their effects on people and institutions should be examined. The Contractor should supply an evaluation plus supporting data and rationale regarding such external social and economic costs as noted below. For each cost, the Contractor should describe the probable number and location of the population group adversely affected, the estimated economic and social impact, and any special measures to be taken to alleviate the impact.

The Contractor should also discuss any effects of plant operation that do not clearly fall under any single topic mentioned above. These may include changes in land and water use at the plant site, interaction of the plant with other existing or projected neighboring facilities, effect of groundwater withdrawal on groundwater resources in the vicinity of the plant, and disposal of solid and liquid wastes other than those discussed above. Any features of the plant producing noise levels outside the suggested levels* should be specifically identified and discussed in relation to adjacent occupancy, both day and night, based on measurements of preconstruction ambient levels. Mitigation measures to reduce noise should be described.

2.6 Unavoidable Adverse Environmental Effects

This section should summarize those adverse environmental impacts and risks, identified in Sect. 2.5 above, that cannot be avoided should the proposed action be implemented. It should also summarize the magnitude and importance of each such effect.

2.7 Irreversible and Irretrievable Commitment of Resources

This section should summarize from the survey of adverse environmental impacts in Sects. 2.5 and 2.6 the extent to which the proposed plant and its alternatives would consume, destroy, or transform scarce or nonrenewable resources, thus curtailing the diversity and range of potential uses of the environment. In this context, "resources" means labor and materials devoted to construction and operation of the proposed plant as well as natural and cultural resources.

2.8 Relationship of Land Use Plans, Policies, and Controls

In this section the Contractor should discuss how the proposed plant may conform or conflict with the objectives and specific terms of

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*See *The Industrial Noise Manual,* American Industrial Hygiene Association, Detroit, Mich.; *Noise Abatement and Control: Departmental Policy Implementation Responsibility and Standards,* HUD Circular 1390.2 (1971); and *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety,* EPA, 550/9-74-004, U.S. Superintendent of Documents, Washington, D.C.

approved or proposed Federal, state, and local land use plans, policies, and controls, if any, for the affected area. Where a conflict exists, this section should describe the extent to which the proposed plant has been reconciled in the plan, policy, or control.

2.9 The Relationship Between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

This section should identify the extent to which the proposed plant would constrain the diversity and range of potential uses of the environment, including nonutilitarian preservation. It should fully assess the cumulative and long-term environmental effects of the proposed plant from the perspective that each generation is trustee of the environment for succeeding generations. This assessment involves consideration of the present condition and use of the site of the proposed plant, its use if the proposed plant is constructed, and the long-term prospects for other uses. An assessment should be made of the extent to which the construction of the plant involves trade-offs between short-term environmental gains at the expense of long-term losses, or vice versa, and a discussion of the extent to which the proposed plant and its alternatives foreclose future options. In this context, short-term and long-term do not refer to any fixed periods but should be viewed in terms of the environmentally significant consequences of the proposed action.

2.10 Alternatives

In this section the Contractor should discuss relevant information pertaining to the availability of alternatives and their relative merits. Alternatives to be considered should include (1) not proceeding with the project, (2) constructing the plant at another site, and (3) modifications in the proposed plant. All available and/or practical alternatives should be included and an analysis of the advantages and disadvantages of each of them compared with the proposed project. The comparative analysis should include environmental as well as monetary factors.

2.10.1 Not proceeding with the project

The alternative of not proceeding with the project should be discussed, including the implication of such nonaction in terms of national energy policies and compliance with existing laws.

2.10.2 Selection of plant site

A detailed description of the process by which the proposed site was selected should be provided. Those environmental, social, or physical factors considered relatively desirable or undesirable should be delineated. The information that the initial site selection process was based upon should be identified, including topographic maps, meteorological data,

river flow rates, demography, land use patterns, and public or private legal constraints. The acceptable alternative sites should be described, and suitable maps, charts, and tables should be used to provide information that can be compared with the features of the proposed site.

Finally, analysis of the information provided should show the relative merits of the proposed site compared to the alternative sites.

2.10.3 Alternative plant designs

The alternative processes and plant designs that are available to accomplish the primary objective of the proposal should be described. This presentation should include those process alternatives that are uniquely different in theoretical concept or engineering scope and also those alternative internal plant designs that might result in reduced environmental impact. In this discussion, the basis for acceptance or rejection of the potential alternatives for further evaluation should be shown. For any reasonable alternative processes or designs, prediction of environmental impacts and monetary costs and the basis for prediction should be provided. Flow sheets, illustrating probable quantities of process waste streams (liquid, gaseous, and solid) and their ultimate disposal in the environment, should be included. Economic evaluation should include estimates of capital investment and annual operating and maintenance costs for the initial year of operation. The monetary costs should also reflect any significant difference in social (community) costs compared with the proposed action. Whether the environmental impact assessments and economic evaluations are quantitative or qualitative, they should be supported by an adequate description and documentation.

2.11 Environmental Trade-off Analysis

This section should synthesize the information contained in the body of the ER and analyze the environmental, socioeconomic, public health, and technological trade-offs associated with the proposed action and reasonable alternatives. This analysis should be sufficiently detailed to permit an independent evaluation of the benefits and risks associated with the proposed action and each alternative so that an informed judgment can be made about the wisdom of undertaking the proposed action rather than one of the alternatives (including the alternative of no action).

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3. CONTINUING ENVIRONMENTAL RESPONSIBILITIES OF CONTRACTORS FOR FOSSIL ENERGY DEMONSTRATION PLANTS

3.1 Introduction

The Contractor will have continuing environmental obligations beyond the initial baseline data collection program and the preparation of an Environmental Report. Since fossil energy conversion is an evolving technology, the scope of the Contractor's continuing environmental obligations cannot be completely defined at this time primarily because of the present uncertainties in effluent characterization, the instability of effluent composition over time, and the unknown environmental interactions of effluents. Therefore, the extent and duration of the continuing environmental program will be determined by DOE in conjunction with the Contractor before the operational phases of this program begin and also during operation.

The objective of the monitoring program, under the Contractor's continuing environmental responsibility, is to provide relevant data for use in assessment of environmental and socioeconomic impacts. These impacts include both those that were predicted in the EIS and those that were not anticipated before operations began. Much of this monitoring program will be a continuation of that undertaken in the baseline survey and reported in the Environmental Report. Additions or deletions and other adjustments to the program will be made by the Contractor in conjunction with DOE. DOE will have a major responsibility for outlining the scope of the program, and the Contractor shall keep in close contact with DOE and be prepared to modify the monitoring program as necessary. In addition, it will be necessary for the Contractor to conform to all Federal, state, and local laws and regulations and to interface with the appropriate agencies during this period. More detailed information on construction and operational monitoring is available in the *Environmental Monitoring Handbook for Coal Conversion Facilities*, ORNL-5319.

3.2 Scope

Initially, all of the following information may not be available because of the evolving nature of the technology. However, as appropriate, the environmental monitoring program should include all pertinent information on sampling design, sampling frequency, statistical methodology and validity, sampling analysis procedure, and instrument accuracy, sensitivity, and reliability (especially for automated sampling systems) which will allow a thorough understanding of the data quality. Sampling locations should be selected to supply data for dispersion model calculations and should conform to those used for baseline sampling as much as possible. Sampling locations and other pertinent descriptive information on sampling placement should be referenced to a map, as described in Sect. 2.3.1 of the Environmental Report data requirements (Part 2 of this document). The names and addresses of the analysis laboratory or consulting firms hired to conduct the sampling and analysis program should be stated.

The Contractor should make it clear that a thorough and comprehensive monitoring program has been established. Differences between the preoperational and operational environmental data collection programs as approved by DOE should be delineated.

3.3 Assessment of Program

The exact environmental monitoring program, including all sampling locations, dates, and analysis routines, should be communicated to DOE in detail at an early date in the data collection effort to allow an in-depth review of the proposed program. Any changes or additions to the monitoring program, which may occur from time to time, based on new information on effluents and their environmental effects should be coordinated with DOE before they are instigated. The Contractor should also describe the plan and rationale for updating the monitoring program during plant construction and operation. Assessment of continuing and developing adverse and beneficial environmental and socioeconomic impacts from data collected under the long-term monitoring program should be made by the Contractor and be submitted to DOE at periodic intervals for review.

3.4 Related Monitoring Programs

Other agencies or public institutions that are collecting environmental data within the region for which the environmental assessment is being carried out should be identified. Their relevance to the monitoring program should be discussed, including any proposed information exchanges.

ACKNOWLEDGMENTS

The assistance of H. T. Jones, D. K. Jones, and W. G. Wilson, Department of Energy, in formulating this document and expediting its completion is appreciated.

Technical assistance and review have been extended by members of several ORNL programs and divisions. Though all of these individuals are too numerous to list, the following contributed significantly to the review of one or more parts of the document: S. I. Auerbach, Environmental Sciences Division; H. M. Braunstein, Energy Division; R. B. Craig and S. G. Hildebrand, Environmental Sciences Division; W. Fulkerson, Energy Division; T. H. Row, Energy Division; and E. G. Struxness, Environmental Sciences Division.

Editorial assistance was provided by members of the ORNL Technical Publications Department. Primary editors included Donna Griffith, Lee Keller, Joe Rich, and Tykey Truett.

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