DE-PS01-89FE61825

SOLICITATION NUMBER

CLEAN COAL TECHNOLOGY III

DEPARTMENT OF ENERGY

ASSISTANT SECRETARY, MANAGEMENT AND ADMINISTRATION
PROCUREMENT AND ASSISTANCE MANAGEMENT

OFFICE OF PROCUREMENT OPERATIONS

OPENING DATE:	May 1, 1989
CLOSING DATE:	August 29, 1989

Use this label for Mailing

DEPARTMENT OF ENERGY
OFFICE OF PROCUREMENT OPERATIONS
ROOM 1J-005 - FORRESTAL BUILDING (MA-451)
1000 INDEPENDENCE AVENUE, S.W.
WASHINGTON, D.C. 20585

ATTN: DOCUMENT CONTROL SPECIALIST

Offer in Response to RFP No. DE-PS01-89FE61825
Closing Date: August 29, 1989 Closing Time: 4:30 P.M.

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DEPARTMENT OF ENERGY
OFFICE OF PROCUREMENT OPERATIONS
ROOM 1J-005 - FORRESTAL BUILDING (MA-451)
1000 INDEPENDENCE AVENUE, S.W.
WASHINGTON, D.C. 20585

ATTN: DOCUMENT CONTROL SPECIALIST

NOTICE TO COURIER: It may not be possible to deliver this package to Room 1J-005 outside of the hours of 8:30 AM to 5:00 PM workdays. Delivery to any other location, including the central delivery area, may result in the late receipt in Room 1J-005 and is strongly discouraged.

Offer in Response to RFP No. DE-PS01-89FE61825
Closing Date: August 29, 1989 Closing Time: 4:30 P.M.

Department of Energy
Washington, DC 20585

MAY 0 1 1989

PROGRAM OPPORTUNITY NOTICE FOR CLEAN COAL TECHNOLOGY DEMONSTRATION PROJECTS

PON NUMBER DE-PS01-89FE61825

Prospective Proposers:

The Clean Coal Technology Demonstration Program is a planned $5-billion national commitment, cost-shared by the Government and the private sector, to demonstrate economic and environmentally sound methods for using our Nation's most abundant energy resource. The Program will foster the energy efficient use of the Nation's vast coal resource base. By doing so, the Program will contribute significantly to the long-term energy security of the United States, will further the Nation's objectives for a cleaner environment, and will improve its competitive standing in the international energy market.

The first two Clean Coal Technology solicitations were issued in 1986 and 1988. This Program Opportunity Notice (PON) is in response to the Clean Coal Technology (CCT) portion of Public Law No. 100-446, "An Act Making Appropriations for the Department of Interior and Related Agencies for the Fiscal Year Ending September 30, 1989, and for Other Purposes." Through this PON, the Department of Energy (DOE) is soliciting proposals for financial assistance required to conduct cost-shared CCT projects to demonstrate energy efficient technologies that are capable of being commercialized in the 1990s. These technologies should be capable of (1) achieving significant reductions in the emissions of sulfur dioxide and/or the oxides of nitrogen from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or (2) providing for future energy needs in an environmentally acceptable manner.

On March 15, 1989, a draft PON was issued, and public comments were requested by March 31, 1989. The comments received were carefully reviewed and used in considering modifications to the original draft PON. Accordingly, prospective proposers are advised that the PON enclosed with this cover letter differs in numerous aspects from the draft PON.

The following is a summary of the salient elements of this PON, but not an integral part of the enclosed PON. In the event of any conflict between this PON cover letter and the enclosed PON document, the data and information in the PON shall prevail.

Each project will consist of three phases: (1) Design, (2) Construction, and (3) Operation. The period of performance is to be proposed.

A Preproposal Conference for this PON will be held on May 18, 1989, at 10:00 a.m., local Washington, D.C., time in the Thomas Jefferson Auditorium, U.S. Department of Agriculture (South Building between the 5th and 6th wings), 14th and Independence Avenue, S.W., Washington, D.C.

Proposals must be submitted in accordance with the instructions in Sections 3 and 5. Each of the four proposal volumes should be bound separately. The proposals must be received at the place designated in Section 3.5, "Time, Date, and Place Proposals Are Due," not later than 4:30 p.m. local time, Washington, D.C., on August 29, 1989.

Only proposals that can satisfy the Qualification Criteria and pass Preliminary Evaluation will be considered for Comprehensive Evaluation. Technical, Business and Management, and Cost evaluation criteria are provided in Section 4. The program policy factors applicable to this PON are described in Section 4.5.

Depending on the evaluated potential of proposals submitted, one or more cooperative agreements may be awarded as a result of this PON.

This PON does not commit the Government to pay any costs incurred in connection with any proposal, or to provide financial assistance to any proposer. The Government reserves the right, without limitation, to accept or reject any or all proposals regardless of the terms of the original proposal, and to request additional clarifying information, including cost and pricing data. DOE, however, may select a proposal for negotiation without conducting discussions with the proposer.

Proposers are advised that a Clean Coal Technology project selected for financial assistance as a result of this PON will be subject to the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) and related DOE compliance procedures. Should a proposal be selected, the proposer will be asked to provide information to be used in preparing necessary NEPA documentation. See Section 3.26, "National Environmental Policy Act (NEPA) Strategy," for more information.

Proposers are advised that although the detail of the cost information requested in the PON is at a summary level, a detailed cost estimate will be requested after selection. During the post selection process, an in-depth review will be made of this detailed cost estimate. At that time if the total project cost has increased over that presented in the proposal, DOE will be under no obligation to increase the amount of DOE funding above that being requested in the original proposal. It is, therefore, anticipated that proposers will give the cost estimate serious attention even though the level of detail in the proposal is lower than other requested information.

All proposers are required to prepare and include in their proposals an abstract of the highlights of their proposed demonstration project, that may be released to the public at any time, in whole or in part. See Section 5.3.1.1., "Public Abstract."

Proposers are cautioned that certain proposal material submitted may become subject to disclosure to the public pursuant to the provisions of the Freedom of Information Act, as amended. See Section 3.27, "Proprietary Data or Confidential Business Information."

The designated Government Representative for this PON is Mr. Herbert D. Watkins. All communications should cite the PON number and be directed to his attention at the address prescribed in Section 3.4, "DOE Issuing Office," or by telephone call to (202) 586-1026.

Proposals must remain valid and be authorized for a period of time for acceptance by the Government of not less than 365 calendar days from the date specified above for receipt of proposals. Furthermore, proposers are cautioned that late proposals, modifications, and withdrawals will be treated in accordance with Section 3.34, "Late Proposals, Amendments of Proposals, and Withdrawals of Proposals."

Please complete and return the "Intention to Propose" form provided in Appendix B at the earliest practicable date. No other material should be returned if there is no intent to submit a proposal.

Sincerely,

David G. Newman, Director
Office of Procurement Operations

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1. DEPARTMENT OBJECTIVE

1.1 INTRODUCTION AND BACKGROUND

On September 27, 1988, Pub. L. 100-446, "An Act Making Appropriations for the Department of the Interior and Related Agencies for the Fiscal Year Ending September 30, 1989, and for Other Purposes" (the "Act"), was signed into law. This Act, among other things, provides funds to conduct cost-shared Clean Coal Technology (CCT) projects for the design, construction, and operation of facilities that would demonstrate the feasibility of future commercial applications of such "... technologies capable of retrofitting or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190 and 100-202 as amended by this Act."

The Act makes available a total of $575 million for this program. Of these monies, $6.906 million will be reprogrammed for the Small Business and Innovative Research Program and $22.548 million will be set aside for Program Direction Funds for costs incurred by the Department of Energy (DOE) for implementation of the CCT-III Program. All of the remaining monies, $545.546 million, will be available for award under this PON.

Congressional guidance directs DOE to issue a "general request for proposals" for the CCT-III Program by May 1, 1989, provides 120 days from issuance of that request for the proposals to be submitted, and requires the selection of projects for negotiation not later than 120 days after receipt of proposals. The Act also specifically addresses levels and forms of cost-sharing applicable to projects proposed under this PON. See Appendix A, page A-14, and Section 7, "Government Financial Participation."

1.2 PON OBJECTIVE

The specific objective of this PON is to solicit proposals to conduct cost shared Clean Coal Technology projects to demonstrate innovative, energy efficient technologies that are capable of being commercialized in the 1990's. These technologies must be capable of (1) achieving significant reductions in the emissions of sulfur dioxide and/or the oxides of nitrogen from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or (2) providing for future energy needs in an environmentally acceptable manner.

2. PROGRAM GUIDELINES

DOE is presenting the following guidelines to assist potential proposers in determining whether a particular technology is eligible for financial assistance under the Third Clean Coal Solicitation (CCT III). These guidelines explain some of the concepts used in the Qualification and Evaluation Criteria presented in Section 4.

1. Technology Eligibility

CCT III is intended to demonstrate novel technologies that utilize coal in an environmentally responsible manner. It is not intended to support research activities nor to deploy currently available commercial technologies.

Candidate technologies must be capable of either retrofitting or repowering existing facilities. Such existing facilities currently may be designed to use any fuel (e.g., coal, oil, gas, etc.) and may be either stationary (e.g., power plants) or mobile (e.g., transportation applications). The demonstration projects, however, can be at new facilities provided the technology is capable of retrofitting or repowering applications.

2. DOE's Financial Role

The Act stipulates that DOE's share of total project costs may not exceed 50%. DOE views its financial role as assisting private sector projects. These projects may be conducted by public-sector participants (e.g., state or local governments and agencies) or may involve other public-sector funding. Title to all real and personal property (other than Government-furnished property) acquired during the demonstration shall vest in the Participant, consistent with the provisions of the Cooperative Agreement.

Further guidance on financial participation is contained in Section 7.

3. Retrofitting and Repowering Defined

For purposes of this PON, retrofit technologies are those which reduce emissions of sulfur dioxide and/or oxides of nitrogen by modifying existing facilities or their present feedstocks or by utilizing new fuel forms (see 4. below).

For purposes of this PON, repowering technologies are those which by replacing a major portion of an existing facility, not only achieve a significant emissions reduction, but also may provide for the use of a new fuel form (see 4. below), increase facility capacity, extend facility life, and/or improve system efficiency.

4. New Fuel Forms Defined

For purposes of this PON, DOE considers a new fuel from coal to be one in which coal has been chemically and/or physically altered with the objective of mitigating emissions of sulfur dioxide and/or oxides of nitrogen.

5. Market Applications

This PON solicits proposals to demonstrate technologies which may have application for utility, industrial, commercial/residential, or transportation markets. Applications of the technologies may include foreign and export markets.

3. TERMS, CONDITIONS AND NOTICES TO PROPOSERS

3.1 CONTENT OF RESULTING AGREEMENT

Any successfully completed negotiation concluded under this PON will result in a cost-shared financial assistance award based on the Model Cooperative Agreement provided in Appendix L and a Repayment Agreement based on the Model Repayment Agreement provided in Appendix M.

3.2 PROGRAM OPPORTUNITY NOTICE (PON) NUMBER

DE-PS01-89FE61825

3.3 DATE OF PON ISSUANCE

May 1, 1989

3.4 DOE ISSUING OFFICE

Department of Energy
Office of Procurement Operations
Contract Operations Division "A" (MA-452.1)
Room Number 1I-065
1000 Independence Avenue, S.W.
Washington, D.C. 20585
Point of Contact: Herbert D. Watkins (Procurement Member, Source Evaluation Board)
Telephone: (202) 586-1026

3.5 TIME, DATE AND PLACE PROPOSALS ARE DUE

Proposals must be received at:

U.S. Department of Energy
Office of Procurement Operations
Forrestal Building, Room 1J-005
1000 Independence Avenue, S.W.
Washington, D.C. 20585
ATTN: Document Control Specialist (MA-451.1)

Proposals must be received NO LATER THAN 4:30 p.m., Washington, D.C. time, on August 29, 1989. (CAUTION: See Section 3.36, "Late Applications, Amendments of Applications, and Withdrawals of Applications.") This PON contains preprinted labels that should be used for mailing or hand delivering proposals.

3.6 AVAILABILITY OF FUNDS

The Government's share of any resulting project costs is subject to the availability of funds appropriated under Pub. L. 100-446. The Act provides that funds appropriated for this program will remain available until expended. Cost sharing by the Government, however, is contingent upon the continued availability of appropriated funds for this program. Funding to cover the Government's share of allowable costs will be provided on an incremental basis.

3.7 PROPOSAL ACCEPTANCE PERIOD

The minimum proposal acceptance period must be 365 days after the deadline for receipt of proposals, as stated in Section 3.5, "Time, Date, and Place Proposals are Due."

3.8 NUMBER OF AWARDS

DOE anticipates that there will be multiple awards resulting from this solicitation.

3.9 SOLICITATION DEFINITIONS

"Award" means financial assistance resulting from this PON.

"Budget Period" means the interval of time into which the project is divided for budgeting and funding purposes.

"Contract" means the resulting Cooperative Agreement.

"Demonstration Project" means the set of activities described in the Statement of Work of any resulting Cooperative Agreement.

"EHSS" means Environmental, Health, Safety and Socioeconomic.

"Funding Plan" means the information submitted by the proposer that details its plan for financial execution of the proposed project.

"Greenhouse Gases" means gases that contribute to atmospheric warming due to their absorption of infrared radiation.

"In-Kind Contribution" means the value of non-cash contribution provided by the participant or third parties. Examples would be the value of property, facilities, equipment, or service.

"NEPA" means the National Environmental Policy Act (42 U.S.C. 4321 et seq.).

"Participant" means the legal entity that is responsible for all aspects of project performance under the Cooperative Agreement.

"Phase" means the set of related tasks which taken together make up one of the three major categories of work under the Demonstration Project (design, construction, or operation).

"PON" means Program Opportunity Notice.

"Project Team" means those organizations or parties responsible for proposing and accomplishing all phases of the demonstration project.

"Proposal" means the document submitted in response to this Solicitation.

"Proposer" means the organization signing the proposal.

"Solicitation" means this Program Opportunity Notice DE-PS01-89FE61825.

"SOW" means Statement of Work.

"Submittal" means proposal.

"United States" means The United States of America and its 50 states, the District of Columbia, the Commonwealth of Puerto Rico, and any possession or trust territory of the United States.

"WBS" means Work Breakdown Structure.

3.10 AN EQUAL RIGHTS NOTE

Wherever, in the PON or Cooperative Agreement, "man," "men," or their related pronouns may appear, either as words or as parts of words (and other than with obvious reference to named, male individuals), they are used for literary purposes and are meant in their generic sense (i.e., to include all humankind -both female and male sexes).

3.11 RESERVED

3.12 INTENTION TO PROPOSE

Please complete the "Intention to Propose" form in Appendix B of this PON and mail it to the address provided on the form by the earliest practical date.

3.13 FALSE STATEMENTS

Proposals must provide full, accurate, and complete information as required by this PON (including all appendices and attachments). The penalties for making false statements in proposals are prescribed in 18 U.S.C. 1001.

3.14 EXPENSES RELATED TO PROPOSER SUBMISSIONS

This PON does not commit the Government to pay any costs incurred in the preparation or submission of any proposal. Such costs include those for studies, designs, or services necessary for the preparation of proposal.

3.15 AMENDMENTS TO THE PON

The only method by which any term of this PON may be modified is by an express, formal amendment to the PON generated by the issuing office. No other communication made at any scheduled preproposal conference or during discussions, whether oral or written, will modify or supersede the terms of this PON. Receipt of an amendment to the PON by a proposer must be acknowledged (see Section 3.16, "Acknowledgement of Amendments to the PON").

3.16 ACKNOWLEDGEMENT OF AMENDMENTS TO THE PON

Proposers shall acknowledge receipt of any amendment to this PON (a) by signing and returning the amendment, or (b) by letter or telegram. The Government must receive the acknowledgement before the time and date specified for receipt of proposals.

3.17 PREPROPOSAL CONFERENCE

A Preproposal Conference for this PON will be held on May 18, 1989, at 10:00 a.m. local Washington, D.C. time in the U.S. Department of Agriculture Auditorium. The purpose is to provide an opportunity for prospective proposers to gain a better understanding of the objectives and requirements of this PON. Questions concerning this PON should be submitted in writing to the Source Evaluation Board Procurement Member named in Section 3.4, and should be received no later than May 11, 1989. Seating will be available on a first come, first served basis.

The Preproposal Conference will be held at the following location:

Department of Agriculture
Thomas Jefferson Memorial Auditorium
(South Building - Between 5th & 6th Wings)
14th Street and Independence Ave. S.W.
Washington, D.C. 20250

3.18 NOTICE OF RIGHT TO REQUEST A PATENT WAIVER

Proposers that are not small businesses or nonprofit organizations have the right to request a waiver of all or any part of the rights of the United States in subject inventions. This request can be made in advance or within 30 days after the effective date of the Cooperative Agreement.

Small businesses and nonprofit organizations need not request a waiver. If the Participant is a small business or a nonprofit organization, the Patent Rights Clause provided in 10 CFR § 600.33(b)(1), [formerly designated § 600.118

(see 53 F.R. 8044 at 8047, Col. 1 (March 11, 1988))] will be included in the Cooperative Agreemnent. This clause permits the recipient of financial assistance to retain title to subject inventions.

3.19 CLASSIFIED MATERIAL

Performance under the proposed award is not expected to involve access to classified material.

3.20 RESPONSIBLE PROSPECTIVE PARTICIPANTS

(a) The general and additional minimum standards for responsible prospective Participants set forth in 10 CFR § 600.30 [formerly designated § 600.104 (see 53 F.R. 8044 at 8046, Col. 3 (March 11, 1988))] apply to this PON.

(b) As authorized by 10 CFR § 600.30 [formerly designated § 600.104 (See F.R. 8044, at 8046, Col. 3 (March 11, 1988))], DOE reserves the right to conduct a preaward review of the proposer's ability to manage and account for Federal funds, or of the proposer's ability to comply with the requirements applicable to a CCT Financial Assistance Award.

3.21 DISCUSSIONS AND SITE VISITS WITH PROPOSERS

Written or oral discussions, or site visits, may be conducted with any of the proposers. If any such discussions or visits are planned, the proposers will be notified of the date, time and place. Proposers are cautioned, however, to present their most favorable position in their proposals and not to rely on the possibility of preselection discussions to supplement their proposals.

3.22 SELECTION NOTIFICATIONS

Written notice will be provided to both successful and unsuccessful proposers after selection. Information about selected projects will be made publicly available.

3.23 DISPOSITION OF PROPOSALS

Proposals will not be returned unless they are withdrawn in agreement with Section 3.34, "Late Proposals, Amendments of Proposals, and Withdrawals of Proposals."

3.24 DISPOSITION OF PON DOCUMENTS

Drawings, specifications, and other documents supplied by DOE with the PON may be retained by the proposer, except documents that are required to be completed and returned as a part of the proposal.

3.25 PROPOSALS SUBMITTED IN RESPONSE TO THE PREVIOUS CCT PROGRAM OPPORTUNITY NOTICES

This PON is not an extension or duplication of the previous Clean Coal Solicitations: DE-PS01-86FE60966 dated February 17, 1986 and DE-PS01-88FE61530 dated February 22, 1988. Proposals submitted in response to the earlier solicitations will not be evaluated or considered in any way with regard to this PON. Prospective proposers are instructed that they must submit a new proposal if they wish to be considered for financial assistance under this PON.

3.26 NATIONAL ENVIRONMENTAL POLICY ACT STRATEGY

An overall strategy for compliance with the National Environmental Policy Act of 1969 has been developed for the Clean Coal Technology Program. It is consistent with the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500-1508) and the DOE guidelines for compliance with NEPA (10 CFR Part 1021). This strategy includes the preparation of a Programmatic Environmental Impact Statement and Project-Specific Environmental Review before projects are selected and project-specific environmental impact analyses after projects are selected.

3.26.1 Programmatic Environmental Impact Statement

DOE is preparing a Programmatic Environmental Impact Statement (PEIS) to be issued before the selections are made for this solicitation. The direct action under consideration in the PEIS is the selection of one or more projects to demonstrate Clean Coal Technologies. The indirect effect of this program is the expected widespread commercialization by the private sector of successfully demonstrated Clean Coal Technologies. It is the potential environmental consequences of widespread commercialization of these technologies in the year 2010 that will be addressed in the PEIS.

3.26.2 Pre-Selection Project-Specific Environmental Review

For proposals that undergo comprehensive evaluation, DOE will prepare pre-selection project specific environmental reviews. Such reviews will summarize the strengths and weaknesses of each proposal against the environmental evaluation criteria including, to the maximum extent possible, a discussion of alternative sites and processes reasonably available to the proposer, a brief discussion of the environmental impacts of each proposal, necessary mitigative measures and, to the extent known, a list of permits and licenses which must be obtained in implementing the proposal.

These confidential environmental reviews will be provided to the Source Selection Official for use in the selection process. In addition, DOE will document the consideration given to environmental factors in a publicly available selection statement. It will record that the relevant environmental consequences of reasonable alternatives have been evaluated in the selection process. This selection statement will be filed with the Environmental Protection Agency, in agreement with the DOE NEPA guidelines.

3.26.3 Post-Selection NEPA Review

Soon after selection, proposers will be requested to submit the environmental information specified in Appendix J, "Information Requirements for the National Environmental Policy Act." This detailed site- and project-specific information will be used as the basis for site-specific NEPA documents prepared by DOE for

each selected project. Such NEPA documents shall be prepared, considered, and published in full conformance with the requirements of 40 CFR Parts 1500-1508 and 10 CFR Part 1021. Proposers, at their own risk, may choose to begin preparation of this material early so that project delays can be avoided. See Section 7.3, "Allowable Project Costs for Cost Sharing Purposes."

3.26.4 Post-Award Environmental Monitoring Review

In addition to the requirements discussed in Section 3.26.3, each Cooperative Agreement entered into will require an Environmental Monitoring Plan (EMP). Guidelines for development of the EMP are provided in Appendix N to the PON. The EMP will detail the collection and dissemination of significant technology, project-, and site-specific environmental data. Besides the data required for compliance with applicable regulations and permits obtained from local, state, and other federal agencies, there may be a need for additional monitoring to verify the performance of mitigative measures. Environmental data on performance of the technology also will be collected to provide a basis for assessing and mitigating the impacts of future commercialization of the technology. The environmental impacts of operation of the facility after completion of the Cooperative Agreement (including disposition of the facility) will be considered to the extent required by DOE's responsibilities under NEPA.

3.27 PROPRIETARY DATA OR CONFIDENTIAL BUSINESS INFORMATION

DOE may be required or authorized to withhold from public disclosure portions of the proposal which contain trade secrets and privileged or confidential commercial or financial information, provided such portions of the proposal have been identified as indicated in the following instructions.

The proposer must identify each proposal page (including each line or paragraph) containing data that the proposer would like withheld from public disclosure. The cover sheet of the proposal must contain the following notice:

NOTICE

> The data contained on pages _____ of this proposal are submitted in confidence and contain trade secrets or privileged or confidential commercial and financial information. Such data may be used or disclosed only for evaluation purposes. If a cooperative agreement is awarded to this proposer as a result of or in connection with the submission of this proposal, the Government shall have the right to use or disclose data herein to the extent provided in the cooperative agreement. This restriction does not limit the Government's right to use or disclose data obtained without restriction from any source, including the proposer.

The proposer must mark every sheet that contains data that it wishes to restrict with the following legend:

> "Use or disclosure of the proposal data in lines specifically identified by asterisk (*) are subject to the restriction on the cover sheet of this proposal."

If there is a request under the Freedom of Information Act (5 U.S.C. § 552) (FOIA) for any data contained in a proposal, DOE's response to the request will be made by following procedures set forth in 10 CFR § 1004.11 (1984). After receiving a FOIA request, DOE may ask the proposer to explain why it believes the requested information should be withheld. The proposer's prompt cooperation will ensure that DOE makes a fully informed and justifiable decision on the FOIA request.

3.28 PREPARATION OF PROPOSALS

(a) Proposers must examine the entire contents of this PON, including all instructions. The proposer assumes the risk of failure to comply with the provisions of this PON.

(b) Each proposer shall furnish the information required by this PON.

(c) Proposals signed by an agent shall be accompanied by evidence of that agent's authority.

3.29 PROPOSAL STRUCTURE

DOE expects that proposals will conform to the PON provision entitled "Proposal Delivery Information" (Section 3.32) and will be prepared in agreement with the instructions provided below. To aid in evaluation, proposals should be clearly and concisely written, as well as being neat, indexed (cross-indexed as appropriate), and logically assembled. The proposal should be typed, double spaced, unreduced in size, on 8.5" by 11" paper. Illustrations should be legible, foldouts should, in general, be held to 11" by 17" size. All pages of each part shall be appropriately numbered, and each part shall contain the name of the proposer, the date, and the PON number. Each of the volumes shall employ the cover sheets as described below in Section 3.30. Each proposal shall be in four volumes:

ORGANIZATION OF PROPOSAL VOLUMES

Volume I: Qualification Proposal; See Section 5.1, "Preparation of Qualification Proposal (Volume I)"

Volume II: Demonstration Project Proposal; See Section 5.3, "Preparation of Demonstration Project Proposal (Volume II)"

Volume III: Commercial Concept Proposal; See Section 5.4, "Preparation of Commercial Concept Proposal (Volume III)"

Volume IV: Cost and Funding Proposal; See Section 5.5, "Preparation of Cost and Funding Proposal (Volume IV)"

3.30 COVER SHEET INSTRUCTIONS

Appendix C of this PON provides four forms that shall be used for the preparation of the cover sheets for the four Volumes identified in Section 3.29. Proposers must complete the forms using the following instructions and then photocopy those four forms for use as (or on) the covers for all copies of each of the four Volumes.

Instructions for all four of the forms are provided below:

(1) Copy Number. Each submittal shall be provided in one original and 14 copies. In this space, indicate the copy number of the particular Volume, using Number 1 for the original and Numbers 2 through 15 for the copies.

(2) Technology. Identify the Clean Coal Technology(ies) employed in the project.

(3) Title. Provide the full title of the submittal. The title should reflect the substance of the proposed project.

(4) Name(s). Identify the name(s) of the proposer(s), listing the proposed Participant first (see Section 3.9, "Solicitation Definitions").

(5) Proprietary Information. See Section 3.27, "Proprietary Data or Confidential Business Information".

3.31 PROPOSAL PACKAGING

Each of the proposal volumes shall be physically separate and entitled as listed below. Fifteen (15) copies are required of each proposal volume (original, to be identified as "Copy 1," plus fourteen (14) copies, to be identified as "Copies 2 through 15"). The required packaging and grouping are:

- o Package 1: Copy 1 of Volume I, Qualification Proposal,
  + Copy 1 of Volume II, Demonstration Project Proposal,
  + Copy 1 of Volume III, Commercial Concept Proposal,
  + Copy 1 of Volume IV, Cost and Financing Proposal.
- o Package 2: Copies 2 through 15 of Volume I, Qualification Proposal.
- o Package 3: Copies 2 through 15 of Volume II, Demonstration Project Proposal.
- o Package 4: Copies 2 through 15 of Volume III, Commercial Concept Proposal.
- o Package 5: Copies 2 through 15 of Volume IV, Cost and Financing Proposal.

Note: All documents that contain original signatures must be in Package 1.

Each group shown above must be packaged individually. This does not prevent assembling more than one, or all, of the groups in a single package. Mark the group number on the outside of each package. External markings for each group and place for submission are indicated on the attached labels. As stated in Section 3.32, "Proposal Delivery Information," the proposer must provide the information required on the labels, including its return address.

3.32 PROPOSAL DELIVERY INFORMATION

(a) Signed Originals

Group No. 1 of the proposal, as explained in Section 3.31, "Proposal Packaging," shall contain the signed originals of all documents requiring signature by the proposer. Subsequent copies of the proposal may use reproductions of the signed originals.

(b) Proposal Delivery

The proposer assumes full responsibility for ensuring that DOE receives the proposal by the date and time specified in Section 3.5, "Time, Date, and Place Proposals are Due." If not sent by the U.S. mail, proposals must be closed and sealed as if for mailing. See also Section 3.34, "Late Proposals, Amendments of Proposals, and Withdrawals of Proposals."

(c) Labels

The labels which immediately follow the PON cover page are for the proposer's use when submitting the proposal and amendments thereto. The packages used to submit the proposal (and any amendments thereto) should be marked as shown on the attached labels. The proposer must complete the blanks on the labels for the PON Number, the closing time and date, and a return address. Note that one label should be used if the proposal is mailed and a different label should be used if the proposal is hand-delivered.

(d) Telegraphic Proposals

Telegraphic proposals will not be allowed. Proposals may be modified, however, by written or telegraphic notice, if received by the time specified for receipt of proposals.

3.33 UNNECESSARILY ELABORATE PROPOSALS

Unnecessarily elaborate proposals or other presentations are not desired. They may be construed as a sign of the proposer's lack of cost consciousness. Elaborate art work, expensive paper and bindings, and expensive visual and other presentation aids are neither necessary nor desired.

3.34 LATE PROPOSALS, AMENDMENTS OF PROPOSALS, AND WITHDRAWALS OF PROPOSALS

(a) Any proposal received after the exact time specified for receipt will not be considered unless it is received before selection is made and it:

i. was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of proposals (e.g., a proposal submitted in response to a solicitation requiring receipt of proposals by the 18th of the month must have been mailed by the 13th);

ii. was sent by mail and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation; or

iii. is the only proposal received.

(b) Any modification of a proposal, unless requested by DOE, is subject to the same conditions as in subparagraphs (a)(i) and (ii) above.

(c) The only acceptable evidence to establish the date of mailing of a late proposal or modification sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark on the wrapper or on the original receipt from the U.S. or Canadian Postal Service. If neither postmark shows a legible date, the proposal, quotation, or modification shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, proposers should

request the postal clerks to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the proposal wrapper or other documentary evidence of receipt maintained by the installation.

(e) Notwithstanding paragraph (a) above, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

(f) Proposals may be withdrawn by written notice or telegram (including mailgram) received at any time before award. Proposals may be withdrawn in person by a proposer or an authorized representative, if the representative's identity is made known and the representative signs a receipt for the proposal before award.

3.35 EXPLANATION TO PROSPECTIVE PROPOSERS

A prospective proposer who would like an explanation or interpretation of this PON must submit a written request to the Procurement Board Member. Allow enough time for the reply to reach all prospective proposers before the submission of their proposals. To be sure that requests for explanation or interpretation will be considered, the requests must be received by the Procurement Board Member by 4:30 p.m., Washington, D.C., time, on August 7, 1989. Oral explanations or instructions provided before selection are not binding. Any information given to a prospective proposer about this PON will be furnished promptly to all other prospective proposers as an amendment of the PON, if that information is necessary in submitting proposals or if the lack of it would be prejudicial to any other prospective proposers.

3.36 FAILURE TO SUBMIT PROPOSAL

Recipients of this PON who choose not to submit a proposal should not return this PON. They should indicate, however, by letter or postcard to the

Procurement Board Member whether they want to receive future solicitations for similar financial assistance opportunities. If a recipient does not submit a proposal and does not say if future solicitations are desired, the recipient's name may be removed from the applicable mailing list. Accordingly, it is essential that recipients complete and return the "Intention to Propose" form provided in Appendix B.

3.37 SELECTION OF PROPOSALS

(a) The Government intends to award financial assistance through cost-shared Cooperative Agreements. These awards will be made to those whose proposals are selected following consideration of the evaluation criteria and program policy factors.

(b) The Government may (1) reject any or all proposals, (2) select for negotiation any proposal, in whole or in part, and (3) waive informalities and minor irregularities in proposals received.

(c) The Government may select proposals for negotiation based on the initial proposals received, without discussions with the proposers. Therefore, each initial proposal should contain the proposer's best possible terms from technical, cost, and business and management standpoints.

(d) Unless a written notice withdrawing the proposal has been received, the Government may select a proposal for negotiations and may make an award of financial assistance during the proposal acceptance period (see Section 3.7).

3.38 FUNDS TRANSFER

Payments by DOE to the Participant under any Financial Assistance Award will be made by electronic funds transfer. Participants will be asked to provide the payee bank information required to make electronic funds transfers. As provided in 10 CFR § 600.112 (b)(1), if DOE payments are made under a Letter of Credit,

the Participant may draw funds as needed for immediate disbursement in accordance with the requirements of Treasury Circular No. 1075 (31 CFR Part 205).

3.39 RIGHTS IN TECHNICAL DATA

The Cooperative Agreement which will be negotiated with successful proposers will present DOE's known requirements for technical data. The Additional Technical Data Requirements clause (see Appendix L, "Model Cooperative Agreement") provides the Government with the option to order additional technical data, the requirements for which are not known at the time of agreement. There is, however, a built-in limitation on the kinds of technical data that may be required. This limitation clause provides that the Participant may withhold delivery of proprietary data. This withholding of proprietary data is the primary means by which the Participant may protect its proprietary position. There are, however, two situations where the Government may need to have limited access to a Participant's proprietary data.

First, paragraph (f) of the Rights in Technical Data clause (see Appendix L, "Model Cooperative Agreement") gives the Contracting Officer's representatives the limited right to inspect, at the Participant's facility, the Participant's proprietary data which were withheld from delivery. This inspection is needed to verify that such data were properly withheld or to evaluate work performance.

Second, paragraph (g) of the Rights in Technical Data clause provides the Government the right to require the Participant to furnish, with limited rights, proprietary data previously withheld. In this case, the limited rights in proprietary data and the Government's obligation for limited use and disclosure of such data provide the means by which the Participant protects its proprietary position. Paragraph (g) will be used where, for programmatic reasons, there is a need for the delivery of proprietary data to the Government. To help in making this programmatic determination, the proposal must state that the work to be performed and the known requirements for technical data as presented in this PON have been reviewed by the proposer. Furthermore, as discussed in Section 5.3, the proposer must exercise one of two options. First, it may state that no data will be withheld. Second, the proposer may submit a list

identifying the proprietary data that, to the best of the proposer's knowledge, likely will be used, acquired, or otherwise obtained during project performance and will be withheld.

Paragraph (c)(3) of the Rights in Technical Data clause, regarding licensing of copyrighted material, paragraph (h), Participant Licensing, and paragraph (j), Commercialization of Technology, shall not normally be included where the Participant is a small business firm or nonprofit organization. For Participants other than small business firms or nonprofit organizations, paragraph (h), modified as necessary by programmatic needs, will be included, and paragraphs (j) and (c)(3) may be included, as determined by programmatic needs to ensure commercialization of the demonstrated technology. Paragraph (i), Availability of Contract and Other Data, will normally be included to provide the Government with rights in data in the event of Participant or Government withdrawal. Paragraph (i), however, may be modified as necessary for the programmatic needs for a particular project. Similarly, paragraph (n) of the "Patent Rights" clause ("Facility Patent License") may be modified as necessary in accordance with programmatic needs.

3.40 REPORTS TO CONGRESS

After selection, DOE will prepare and submit to Congress the following reports:

(1) A comprehensive report on the proposals received and

(2) A full and comprehensive report on each project selected will be submitted to Congress at least 30 calendar days before the planned execution of any Cooperative Agreement. This report will include the facts and circumstances relied upon in support of the proposed project. Each report will include an analysis describing the environmental impacts that may be produced from the projected commercial application of the generic technology representing the proposer's technology. The report will focus on the projected effects in the year 2010.

3.41 CERTIFICATION REGARDING DRUG-FREE WORKPLACE REQUIREMENTS

Instructions for Certification

1. By signing and/or submitting this application or cooperative agreement, the awardee is providing the certification set out below.

2. The certification set out below is a material representation of fact upon which reliance was placed when the agency determined to award the cooperative agreement. If it is later determined that the awardee knowingly rendered a false certification, or otherwise violates the requirements of the Drug-Free Workplace Act, the agency, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

3. For awardees other than individuals, Alternate I applies.

4. For awardees who are individuals, Alternate II applies.

Certification Regarding Drug-Free Workplace Requirements

Alternate I

A. The awardee certifies that it will provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the awardee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing a drug-free awareness program to inform employees about-

(1) The dangers of drug abuse in the workplace;

(2) The awardee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the cooperative agreement be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the cooperative agreement, the employee will-

(1) Abide by the terms of the statement and

(2) Notify the employer of any criminal drug statute conviction for a violation occurring in the workplace no later than five days after such conviction;

(e) Notifying the agency within ten days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction;

(f) Taking one of the following actions, within 30 days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted-

(1) Taking appropriate personnel action against such an employee, up to and including termination; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(g) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (a), (b), (c), (d), (e) and (f).

B. The awardee shall insert in the space provided below the site(s) for the performance of work done in connection with the specific cooperative agreement:

Place of Performance (Street address, city, county, state, zip code)

Alternate II

The awardee certifies that, as a condition of the cooperative agreement, he or she will not engage in the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance in conducting any activity with the cooperative agreement.

3.42 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS-PRIMARY COVERED TRANSACTIONS

Instructions for Certification

1. By signing and submitting this proposal, the prospective primary Participant is providing the certification set out below.

2. The inability of a prospective Participant to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective Participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with DOE's determination whether to enter into this transaction. Failure of the prospective primary Participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when DOE determined to enter into this transaction. If it is later determined that the prospective primary Participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the DOE may terminate this transaction for cause or default.

4. The prospective primary Participant shall provide immediate written notice to DOE if at any time the prospective primary Participant

learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "DOE List," "Nonprocurement List," "suspended," "ineligible," "lower tier covered transaction," "Participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the DOE rules implementing Executive Order 12549. See, 10 CFR Part 1036 [53 F.R. 19204 (May 26, 1988)].

6. The prospective primary Participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by DOE.

7. The prospective primary Participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by DOE without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A Participant in a covered transaction may rely upon a certification of a prospective Participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A Participant may decide the method and frequency by which it determines the eligibility of its principals. Each Participant may, but is not required to, check the DOE List and the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good

faith the certification required by this clause. The knowledge and information of a Participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a Participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, DOE may terminate this transaction for cause or default.

Certification

(1) The prospective primary Participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary Participant is unable to certify to any of the statements in this certification, such prospective Participant shall attach an explanation to this proposal.

4. EVALUATION CRITERIA AND PROGRAM POLICY FACTORS

4.1 INTRODUCTION

The prime consideration in the evaluation of proposals for financial assistance is to assess their merit in order to determine those proposals that offer the greatest likelihood of successfully demonstrating and subsequently commercializing emerging Clean Coal Technologies. The process of evaluation will consist of:

(a) Qualification,

(b) Preliminary Evaluation,

(c) Comprehensive Evaluation,

(d) Consideration of Program Policy Factors, and

(e) Application of Other Considerations.

The Source Selection Official will select proposal(s) for negotiations leading to award by taking into account the evaluation criteria and relevant program policy factors in order to determine the mix of projects that will best further the objectives and goals of this PON.

4.2 QUALIFICATION

In order to be considered in the Preliminary Evaluation phase, a proposal must successfully pass Qualification. Failure to meet one or more of the Qualification Criteria will result in rejection of the proposal. In the event that a proposal is rejected, a notice will be sent to the proposer stating the reason(s) that the proposal will not be considered for financial assistance under this solicitation.

The proposal must meet the following Qualification Criteria:

(a) The proposed demonstration project or facility must be located in the United States.

(b) The proposed demonstration project must be designed for and operated with coal(s). These coals must be from mines located in the United States.

(c) The proposer must agree to provide a cost share of at least 50 percent of total allowable project cost, with at least 50 percent in each of the three project phases.

(d) The proposer must have access to, and use of, the proposed site and any proposed alternate site(s) for the duration of the project.

(e) The proposed project team must be identified and firmly committed to fulfilling its proposed role in the project.

(f) The proposer agrees that, if selected, it will submit a "Repayment Plan" consistent with Section 7.4.

(g) The proposal must be signed by a responsible official of the proposing organization authorized to contractually bind the organization to the performance of the Cooperative Agreement in its entirety.

4.3 PRELIMINARY EVALUATION

In order to be considered in the Comprehensive Evaluation phase, a proposal must successfully pass Preliminary Evaluation. Failure to meet one or more of the Preliminary Evaluation requirements will result in rejection of the proposal. In the event that a proposal is rejected, a notice will be sent to the proposer stating the reason(s) that the proposal will not be considered for financial

assistance under this solicitation. The requirements of the Preliminary Evaluation are as follows:

(a) The proposal must be consistent with the objectives of this PON, as stated in Section 1.2.

(b) The proposal must contain sufficient business and management, technical, cost, and other information to enable Comprehensive Evaluation as described in the solicitation. The Proposal must include an explicit funding plan for the project.

4.4 COMPREHENSIVE EVALUATION

Proposers passing Preliminary Evaluation will have their Demonstration Project Proposal (Volume II), Commercial Concept Proposal (Volume III), and Cost and Financing Proposal (Volume IV) evaluated. This comprehensive evaluation will be performed against the criteria listed in this section. These criteria are divided into two categories.

The Technical Evaluation is conducted to determine the merits of the proposal with regard to the potential for success of both the demonstration project itself as well as the future commercial application of the demonstrated technology. As a result, the Technical Evaluation Criteria are further classified into Demonstration Project Factors and Commercialization Factors. The evaluation in this category results in a numerical score for each proposal against each of the Technical Evaluation Criteria.

The Business and Management Evaluation is conducted to determine the business and management performance potential of the proposer. The evaluation in this category results in adjectival ratings of each proposal against each of the Business and Management Evaluation Criteria.

4.4.1 Technical Evaluation Criteria

The Technical Evaluation Criteria are divided into two major categories. The Demonstration Project Factors deal with the proposed demonstration project

itself. The criteria in this category assess the technical feasibility and likelihood of success of the project.

Commercialization Factors address the projected commercial applications for the demonstrated technology. The criteria in this category assess the potential of the proposed technology to reduce emissions from existing facilities as well as to meet future energy needs through the environmentally acceptable use of coal. They will assess the cost effectiveness of the proposed technology against existing technologies.

4.4.1.1 Demonstration Project Factors

(a) Technical Readiness

Technical readiness for demonstration at the size proposed, as evidenced by the adequacy, availability, suitability, and quality of the data and analyses supporting a decision to advance to demonstration scale.

(b) Adequacy, Appropriateness, and Relevance of Demonstration

Adequacy, appropriateness, and relevance of the proposed project to contribute to the enhancement of technologies, techniques, or processes, and provide new information to enable the private sector to make rational commercial decisions concerning utilization of the proposed technology.

(c) Environmental, Health, Safety, Socioeconomic, and other Site-Related Aspects

Adequacy and appropriateness of proposed approaches for meeting or exceeding all EHSS requirements during all phases of the proposed project for mitigating the risks and impacts of the EHSS aspects of the proposed demonstration project. Degree to which current emissions of sulfur dioxide and/or the oxides of nitrogen are reduced, especially emissions which contribute to transboundary pollution. The suitability, quality, and adequacy of the site(s) and/or facility(ies) for the proposed demonstration project.

(d) Technical and Management Approach and Organizational Capability

Reasonableness and adequacy of the technical approach of the proposer to design, construct, operate, and, if applicable, dismantle the proposed demonstration facility. Quality and completeness of the proposer's Statement of Work and management approach for the demonstration project. Credentials, experience, and availability of the proposer, identified key personnel, and other personnel and resources (e.g., facilities) needed to support the project.

4.4.1.2 Commercialization Factors

(a) Environmental Performance at Existing Facilities

The extent to which the proposed technology when used at existing facilities can, with minimal EHSS impacts, reduce emissions of sulfur dioxide and/or the oxides of nitrogen and reduce transboundary and interstate air pollution. The degree to which the proposed technology is likely to be more cost effective than existing technology for reducing emissions. Additional credit shall be given for technologies that generate minimal amounts of solid waste by making useful (or harmless) byproducts and/or that reduce emissions of greenhouse gases (e.g., by improving efficiency).

(b) Environmental Performance While Addressing Future Energy Needs

The extent to which the proposed technology can, with minimal EHSS impacts, supply future energy needs from coal with minimal emissions of sulfur dioxide and/or the oxides of nitrogen and attendant transboundary and interstate air pollution. The degree to which the proposed technology is likely to be more cost effective than alternative competing technologies. Additional credit shall be given for technologies that generate minimal amounts of solid waste by making useful (or harmless) byproducts and/or that reduce emissions of greenhouse gases (e.g., by improving efficiency).

(c) Commercialization Plan

Adequacy of the plan for bringing the technology from the demonstration to widespread commercial application in the 1990s. The capability and commitment of the proposed project team to commercialize the technology demonstrated in this project.

4.4.2 Business and Management Evaluation Criteria

(a) *Funding Plan, Capability to Fund the Demonstration*

Adequacy and completeness of the plan to fund or finance the project. Financial condition and capability of the proposed funding sources to provide the proposed non-Federal share of project costs. Additional consideration will be given to executed financing arrangements and specific plans for providing for any potential funding shortfall.

(b) Financial Commitment to the Project

Degree of priority placed by the team's management on the project. Included herein is the degree of financial risk that is assumed by the proposer in this project. Additional consideration will be given for proposer cost sharing above the minimum 50 percent required, particularly in the early phases of the project.

4.4.3 Relative Importance of Criteria

The Technical Evaluation Criteria are three times as important as the Business and Management Evaluation Criteria.

Within the technical evaluation, each criterion will have the following weight:

Demonstration Project Factors		
Technical Readiness	30%	
Adequacy, Appropriateness, and Relevance of the Demonstration	20%	
EHSS and other Site-Related Aspects	5%	
Technical and Management Approach and Organizational Capability	5%	
SUBTOTAL - Demonstration Project Factors		60%
Commercialization Factors		
Environmental Performance at Existing Facilities	20%	
Environmental Performance While Addressing Future Energy Needs	10%	
Commercialization Plan	10%	
SUBTOTAL - Commercialization Factors		40%
TOTAL		100%

Within the Business & Management Evaluation Criteria, the Funding Plan, Capability to Fund the Demonstration criterion is somewhat more important than the Financial Commitment to the Project criterion.

The Cost Estimate will be evaluated to determine the reasonableness of the proposed cost but will be of minimal importance to the selection.

4.4.4 Guide for Proposal Evaluation

DOE presents Table 1 as an aid to proposers in determining where to display information within the proposal. The criteria that DOE will use to evaluate proposals are listed in the left hand column. The proposal section in which the information should be presented is displayed across the top.

The marks within each box represent whether DOE considers the section to be the primary (P) or secondary (s) source of information to use in its determinations.

In the case of the Commercialization Plan, for example, Sections III A and C will be important, but the primary source of information for the DOE evaluation of the Commercialization Plan will be Section III D.

DOE reserves the right to use any portion of a proposal in its evaluation.

TABLE 1

Guide for Proposal Evaluation

PROPOSAL SECTION* / CRITERIA	II						III				IV		
	A	B	C	D	E	F	A	B	C	D	A	B	C
Demonstration Factors													
(a) Tech. Readiness		s	P										
(b) Adequacy		s	P										
(c) EHSS				P	P								
(d) Approach			s			P							
Commercialization													
(a) Existing Facilit.								P					
(b) Future Use							s		P				
(c) Commercialization							s		s	P			
Business & Management													
(a) Funding Plan												P	
(b) Commitment													P
Cost											P		

* (See Section 5.2)

4.5 PROGRAM POLICY FACTORS

Program policy factors are factors which the Source Selection Official may use to select a range of projects that would best serve program objectives. In the following factors, the word "collectively" is meant to include projects selected in this solicitation and prior Clean Coal solicitations, as well as, other ongoing demonstrations in the United States. The following program policy factors shall be considered:

(a) The desirability of selecting projects that collectively represent a diversity of methods, technical approaches, and applications.

(b) The desirability of selecting projects in this solicitation that contribute to near term reductions in transboundary transport of pollutants by producing an aggregate net reduction in emissions of sulfur dioxide and/or the oxides of nitrogen.

(c) The desirability of selecting projects that collectively utilize a broad range of U.S. coals and are in locations which represent a diversity of EHSS, regulatory, and climatic conditions.

(d) The desirability of selecting projects in this solicitation that achieve a balance between (1) reducing emissions and transboundary pollution and (2) providing for future energy needs by the environmentally acceptable use of coal or coal-based fuels.

4.6 OTHER CONSIDERATIONS

In the project selection process, DOE will consider giving preference to projects located in states for which the rate-making bodies of those states treat the Clean Coal Technologies the same as pollution control projects or technologies.

The inclusion of this project selection consideration is intended to encourage states to utilize their authorities to promote the adoption of Clean Coal Technology projects as a means of improving the management of air quality within their areas and across broader geographical areas. Recognizing the benefits of pollution control to society, some states offer utilities more favorable rate treatment for pollution control equipment than for other utility investments. States which offer such incentives to Clean Coal Technologies may also serve to offset a portion of the additional risk inherent in demonstrations of new technologies.

The term "will consider giving preference" means that the Source Selection Official will use this consideration as a tie breaker if, after application of the evaluation criteria and the program policy factors, two projects receive identical evaluation scores and remain essentially equal in value. This consideration will not be applied if, in doing so, the regional geographic distribution of the projects selected would be altered significantly.

Since DOE recognizes that actions pending by a ratemaking body take time to implement, a state will be considered to be treating Clean Coal Technologies the same as pollution control projects or technologies if the state regulatory body has taken action that indicates that the ratemaking body intends to implement such a policy prior to DOE's funding of any affected project(s).

5. PROPOSAL PREPARATION INSTRUCTIONS

5.1 PREPARATION OF QUALIFICATION PROPOSAL (VOLUME I)

The preparation of this Volume is very important. If the proposal does not meet the requirements identified in Section 4.2, "Qualification," the proposal shall not undergo Preliminary and Comprehensive evaluation. The proposer must address each of the Qualification Criteria listed in Section 4.2 and show how the proposal meets those criteria. The discussion should be sufficient unto itself for a determination whether the proposal meets the Qualification Criteria. DOE has no obligation to refer to other volumes if the discussion provided in Volume I does not show that the Qualification Criteria have been met. For those criteria that require the completion of the certification forms provided in Appendix D, these forms must be submitted in this Volume. Such certifications must be completed and signed by an individual with authority to bind legally the proposing organization. The information required to satisfy the Qualification Criteria is shown below:

(a) LOCATION OF DEMONSTRATION

The proposed demonstration project or facility (existing or new) must be located in the United States.

The proposer must identify the proposed location and show that it is within the United States. Information provided must include the state, county, and municipality (if applicable) in which the project(s) or facility(ies) will be located.

(b) USE OF UNITED STATES COAL(S)

The proposed demonstration project must be designed for and operated with coal(s). These coals must be from mines located in the United States.

The proposer must provide a description of the type(s) and source(s) of coal(s) sufficient to verify that the coal(s) will be mined in the United States.

(c) COST SHARING

The proposer must agree to provide a cost share of at least 50 percent of the total project cost, with at least 50 percent in each of the three project Phases.

The proposer must complete the Certification Form contained in Appendix D and include it in Volume I of the proposal. Signing this form will confirm that the Government's cost share will not exceed 50 percent in any of the three project Phases.

(d) SITE AVAILABILITY

The proposer must have access to, and use of, the proposed site(s) and any proposed alternative site(s) for the duration of the project.

The proposer must document its access and right of use to the site. This documentation should include evidence of the proposer's ownership of the site, option to purchase the site, lease for the site, or letter signed by the owner of the site which provides firm evidence of the commitment of the owner to assure availability of the site. A letter from the site owner, if provided, must be signed by a corporate official or other appropriate person with authority to make binding commitments about use of the site.

(e) PROJECT TEAM AGREEMENTS

The proposed project team must be identified and firmly committed to fulfilling its proposed role in the project. The project team should be made up of those organizations or parties responsible for proposing and accomplishing all phases of the demonstration project. The project team includes the legal entity responsible for the project (i.e., the

prospective Participant), technology licensors, and other third parties identified in this proposal (excluding financial institutions) who are essential to the successful completion of the proposed demonstration project. Where a legal entity has been or will be created to conduct the project, DOE will consider the participating organizations or parties (partners, joint venture members, etc.) as project team members.

The proposer shall provide from each member of the team a legally binding agreement, or letter of intent to reach such agreement, that explicitly states the role of the team member in the project and the nature of its business relationship for purposes of this project. These documents must be signed by a corporate official or other appropriate person authorized to bind legally these entities. These letters shall be included in Volume I of the proposal.

(f) REPAYMENT

The proposer agrees that, if selected, it will submit a Repayment Plan consistent with Section 7.4.

The proposer must complete the Certification Form contained in Appendix D and include it in Volume I of the proposal. The Certification will serve to affirm that a Repayment Plan will be submitted after selection. (See Section 7.4, "Recovery of Government's Investment.")

(g) AUTHORIZATION

The proposer must complete and include in Volume 1 of the proposal:

- SF 424 in Appendix G if proposer is a state or local government or Indian Tribe or
- Authorization Certification, in Appendix G, if the proposer is a nongovernmental entity.

5.2 ORGANIZATION OF VOLUMES II - IV

To help in the evaluation, all proposals must adhere to the following outline:

Volume II: Demonstration Project

- II.A. Introduction
- II.B. Project Technical Description
- II.C. Detailed Description of Novel Technology
- II.D. Site
- II.E. Project Environmental Aspects
- II.F. Project Management Approach
- II.G. Exceptions, Deviations, and Assumptions

Volume III: Commercial Concept

- III.A. Introduction
- III.B. Application to Existing Facilities
- III.C. Applications to Future Energy Needs
- III.D. Commercialization Plan
- III.E. Exceptions, Deviations, and Assumptions

Volume IV: Cost and Financing

- IV.A. Cost Estimate
- IV.B. Funding Plan, Capability to Fund the Demonstration
- IV.C. Financial Commitment to the Project
- IV.D. Exceptions, Deviations, and Assumptions

5.3 PREPARATION OF DEMONSTRATION PROJECT PROPOSAL (VOLUME II)

The purpose of this Volume is to describe the demonstration project itself. The format for this Volume asks for information in increasing levels of detail.

5.3.1 Proposal Section II.A - Introduction

The proposer shall provide a Public Abstract and a Project Summary Form which will give an overview of the demonstration project and the proposed technology.

5.3.1.1 Public Abstract

The Public Abstract shall consist of not more than 750 words giving a brief overview of the proposed project, the specific, proposed Clean Coal Technology, the title of the project, the name of the proposer, the full mailing address of the proposer, and the key members of the proposed project team. The name and telephone number of a primary contact is also desirable at the discretion of the proposer. Not more than two 8.5" x 11" diagrams may be submitted by the proposer. This abstract may be released to the public by DOE in whole or in part at any time. It, therefore, should not contain proprietary data or confidential business information. The form that should be used for the preparation of the public abstract appears in Appendix E. Additional sheets may be added as necessary.

5.3.1.2 Project Summary Form

The proposer shall complete and submit the Project Summary Form provided in Appendix F. Information considered to be proprietary or business confidential should be appropriately marked. DOE will use this form, excluding proprietary and business confidential information, in its Comprehensive Report to Congress which is issued after selection. Instructions for completing this form are:

(1) Technology. Same as for the proposal cover forms, Item (2). See Section 3.30, "Cover Sheet Instructions".

(2) Project Title. Same as for the proposal cover forms, Item (3). See Section 3.30, "Cover Sheet Instructions".

(3) Proposer's Name. Same as for the proposal cover forms, Item (4). See Section 3.30, "Cover Sheet Instructions".

(4) Proposer's Address. Provide the full mailing address of the proposer (see Item (3)). This address should reflect the party whom DOE will contact when necessary.

(5) Primary Contact. Enter the name, title, and phone number for the person whom DOE should contact if the need arises.

(6) Project Location. Identify the geographic location(s) of the proposed project to the extent possible.

(7) County(ies). Corresponds to above Item (6).

(8) Applications. Refers to commercial use of proposed Clean Coal Technology, e.g., retrofit to coal-fired industrial boiler, repowering of large electric utility generating unit, and new fuel forms, etc.

(9) Types of Coal to be Used in the Proposed Demonstration Project, coal bed name and typical sulfur content, e.g., Pittsburgh Number 8 (3% sulfur).

(10) Coal Source. Refers to above Item (9); mine and location if known.

(11) Coal Use Rate or Other Measure of Proposed Project Size, e.g., 10 tons of coal/hour, 650 MWe power plant retrofit, etc.

(12) Proposed Duration of Each Project Phase, in months.

(13) Proposed Project Total Duration, in months.

(14) Estimated Total Cost of the Project (Proposer and Government).

(15) Proposer's Cost Share. State the percentage of the total given for above Item (14).

(16) Proposed Project Cost by Phase. Must agree with above Item (14).

(17) Proposer's Cost Share for Each Phase. State as percentages of the costs given for above Item (16).

(18) Project Team Members. (See Section 3.9, "Solicitation Definitions," and Section 5.1, "Preparation of Volume I: Qualification Proposal," Part (e), "Project Team Agreements.") Use an additional sheet of paper if necessary.

5.3.2 Proposal Section II.B - Project Technical Description

The proposer shall provide a general description of the proposed project. This discussion should show how the demonstrated technology will be used either alone or in combination with other available technology options. This discussion should address the following topics:

- The process concept and how it operates (include a flowsheet with major equipment items and energy and material balances indicating temperature, pressure, and composition of major streams).
- Inherent advantages of the process compared with available commercial technologies.
- The important process chemistry.
- Other information the proposer believes is necessary to provide a clear understanding of the processes involved in the demonstration facility.

5.3.3 Proposal Section II.C - Detailed Description of Novel Technology

5.3.3.1 Proposal Section II.C.1 - Proposed Technology Description

The proposer must provide a specific discussion of the innovative aspects of the proposed technology. A technology envelope must be drawn around that portion of the proposed facility that represents the novel aspects of the demonstration. Equipment outside of this envelope should be commercially available and represent a low to negligible technical risk in the service proposed. The proposer must identify the demonstration technology so that Demonstration Project Factors (a) and (b) can be evaluated (see Section 4.4.1.1).

5.3.3.2 Proposal Section II.C.2 - Technology Development Status and Readiness for Demonstration

The proposal must discuss and provide evidence of the readiness of the technology for demonstration at the size proposed. The proposer must document work accomplished to date, including a discussion of the data collected in the earlier development of the technology. The extent of process work completed to date, including throughput, conditions of operation, and duration of testing must also be provided. The key process transitions (where applicable) from bench to pilot scale and from batch to continuous operation must be discussed and data and results from these operations should be provided to demonstrate that a sufficient basis exists for scaleup.

A discussion also must be provided to show the degree of scaleup required to bring the technology from its current state of development to the demonstration scale proposed. In this scaleup discussion, the proposer must identify all significant items of equipment and processes that have not operated at the proposed scale and/or conditions of operation expected during the demonstration project. Discuss key process integration issues, risks and uncertainties, and any relevant tests conducted to date.

The technical risks that could affect the success of the demonstration project must be identified and discussed. The discussion must address any measures proposed to mitigate or overcome these risks. The proposer also should provide

any other pertinent information that serves to show that the data base supports the decision to advance the technology to the proposed demonstration scale.

5.3.3.3 Proposal Section II.C.3 - Adequacy, Appropriateness, and Relevance of the Demonstration

The proposer must explain how the information generated during the demonstration project will enable the private sector to make rational commercialization decisions. The project itself must demonstrate all the facets of the proposed technology that are inside the technical envelope (see Section 5.3.3.1) and that are key to commercial implementation (e.g., process integration, vessel scale, etc.). The demonstration project, however, need not be a complete, full-scale prototype commercial plant. It may be, for example, a single module in a multi-module plant or be of smaller than commercial scale. The proposer does not need to include all the unit operations that would be present in a commercial plant if evidence is submitted showing that the components or subsystems not included have already been successfully demonstrated or are used commercially. If these components or subsystems are being demonstrated elsewhere, or are planned to be demonstrated elsewhere, the proposer must provide complete information on these activities. This discussion should be sufficient to explain how the results of these other demonstrations will add to the database needed for commercialization.

As part of this discussion, the proposer must address at least the following topics:

- Rationale for project size
  - justification of project size regarding expected commercial applications,
  - document circumstances where financing or other considerations require larger sizes than otherwise needed for demonstration.

- o Relationship to other work
  - degree to which technical approach has not been demonstrated at commercial scale,
  - justification for duplication with other demonstrations.
- o Degree of uncertainty in moving from demonstration to commercial scale
  - identify key data and test results (technical, economic, environmental, and operating) from demonstration project that are needed to support the commercialization,
  - how will the demonstration data be utilized.

5.3.4 Proposal Section II.D - Site

5.3.4.1 Proposal Section II.D.1 - Site Description

Describe the site location and salient characteristics including the requirements and availability of labor, raw materials, utilities, and other infrastructure needed for construction and operation. For key resources such as coal and water, state requirements and the plan to acquire them including resources, methods of extraction, transportation, and beneficiation. For water, discuss potential constraints on availability.

5.3.4.2 Proposal Section II.D.2 - Site Suitability

Discuss the advantages and disadvantages of the proposed site in the context of the demonstration. This discussion should include any interfaces with existing facilities.

5.3.5 Proposal Section II.E - Project Environmental Aspects

Information supplied in this section will be used in the preparation of the "Pre-Selection Project Specific Environmental Review" (See Section 3.26.2).

5.3.5.1 Proposal Section II.E.1 - Emission Reduction of SO2 and NOx

Analyze and discuss the changes in emissions of SO2 and NOx attributable to the project, including the effects of modifications in equipment and operating procedures (e.g., load factor and output). Discuss any special considerations that should be taken into account by DOE in evaluating impacts of project-related emissions changes on air quality and acidic deposition.

5.3.5.2 Proposal Section II.E.2 - Production and Handling of Other Effluents, Wastes, and Byproducts

Describe the provisions for handling and managing solid and liquid wastes, describing methods for storage, treatment, transportation, use, or disposal. Estimate volumes and composition of each waste stream and final product. For disposal, discuss whether stabilization or pretreatment will be required, the availability of disposal sites, and whether liners and monitoring will be required at disposal sites. If utilization of waste is planned, describe the uses and markets.

5.3.5.3 Proposal Section II.E.3 - EHSS Compliance

Identify EHSS requirements as of January 1, 1989, applicable to the demonstration and describe the capability to comply with relevant EHSS regulations and standards. Estimate environmental discharges (air emissions, water effluents, liquid and solid wastes, etc.) and compare with relevant standards. Provide data and analyses to support conclusions about compliance, including relevant preproposal test data, analyses of technology and process performance. Include information about similar applications for any planned control technologies. Summarize the status and schedule for obtaining permits, modifications to permits required for existing facilities, and anticipated impediments to the permitting process. Discuss options available for controlling discharges (e.g., process

design variations and alternative control methods) if compliance problems exist (e.g., performance shortcomings or more stringent regulations).

5.3.5.4 Proposal Section II.E.4 - EHSS Risks and Impacts

Identify EHSS risks and impacts of the proposed project, such as potential impacts on human and animal populations, historical sites, parks, wilderness areas, and sensitive resources within the range of influence of the project. Also summarize the general approach, special safeguards, and environmental controls that will be used to ensure the protection of project workers and local residents from health and safety risks. If retrofitting or repowering an existing facility, directly compare the EHSS attributes of the project to those of the existing facility. Describe discharge reductions or increases resulting from the project. In particular, estimate changes in air emissions and water effluents and their impact on local air and water quality.

5.3.6 Proposal Section II.F. - Project Management Approach

5.3.6.1 Proposal Section II.F.1. - Technical Approach

The proposer should describe the plans for the demonstration project at a level of detail appropriate for the planning stage of a demonstration project.

The proposer must define and discuss the logic for the technical approach employed to complete the project. This discussion must include but is not limited to the following aspects:

- how pre-demonstration background data will be used to design the demonstration facility,
- how operations will be conducted to collect the data identified in Section II.C.3, and
- how project technical and environmental data will be analyzed and reported.

The proposer must provide a SOW of sufficient detail for inclusion in a Cooperative Agreement. This SOW should appear as Appendix A to Volume II of the proposal. The SOW must outline the project tasks according to a WBS listing the logical sequence of activities to complete the project. The proposed SOW must define the project work and be structured in agreement with the following WBS:

WBS Level 1 - Total Project
WBS Level 2 - Project Phases
WBS Level 3 - Work Tasks

Project phases should be structured as follows:

Phase 1: Design
Phase 2: Construction
Phase 3: Operation

The Government requires the reporting of certain technical, economic, and environmental data that will result from the project. Attachment C to the Model Cooperative Agreement (Appendix L) contains the list of expected reports. Proposers should review this list and make suitable provisions in project planning. The SOW must also provide for formal project reviews. The number and timing of such reviews should be consistent with the size and scope of the demonstration project.

5.3.6.2 Proposal Section II.F.2 - Milestone Schedule

The proposer must provide and discuss a milestone schedule which identifies project phases and major decision points. A discussion of the Government role in project decision making appears in Section 6.3 and in Article III(B) of the Model Cooperative Agreement (Appendix L).

The three project phases must correspond to design, construction, and operation, as shown in Section 5.3.6.1. Subdivision and overlap of the phases, however, is permissible. Key milestones during each phase should be identified and described.

The major project decision points identified by the proposer will represent explicit decisions by both the participant and DOE either to continue or end participation in the project. These decision points need not correspond to the beginning or end of project phases. They will serve, however, to define the project budget periods. As a result, the proposer should explain the rationale for the decision points selected. A discussion of the precise mechanism to provide for continuation from one budget period to the next appears in Section 6.3. See also Appendix L, Article VIII, Project Decision Making.

5.3.6.3 Proposal Section II.F.3 - Project Organization, Capabilities, and Availability

The proposer must describe the project team, showing organizational and functional relationships. The proposer should describe the experience and success of the project team with projects involving similar technologies and projects of similar scope or complexity. An organization chart showing key personnel with man-hours and percentage of key-personnel time that will be devoted to the proposed project shall be included. A statement of availability of all key personnel also shall be included.

Resumes of key personnel, describing education, technical/management experience, and professional development shall be provided. Resumes of personnel identified for specific positions shall present relevant qualifications. The proposer should expect that these key personnel will be named in the Cooperative Agreement.

List all other resources (e.g., facilities) proposed for use in the Demonstration Project.

5.3.7 Proposal Section II.G. - Exceptions, Deviations, and Assumptions

The proposer shall identify and explain exceptions, deviations, or conditional assumptions taken to the requirements of this Volume. Any exceptions, deviations, or conditional assumptions taken must contain enough explanation and justification to permit evaluation. Too many exceptions, or one or more

significant exceptions, may result in rejection of the proposal as unacceptable. Selection of a proposal for negotiation will not be an indication that DOE accepts the exception, deviation, or conditional assumption contained in the proposal.

5.4 PREPARATION OF COMMERCIAL CONCEPT PROPOSAL (VOLUME III)

In Volume III, DOE expects the proposer to present the commercial embodiment of the demonstration technology as envisioned by the technology owner. This information will be used to evaluate the potential for commercial replication of the technology.

In Proposal Sections III.A, III.B, and III.C, DOE requires the proposer to discuss the following points:

- describe the expected commercial embodiment of the technology (i.e., the manner in which the technology will be used),
- describe the intended market for the technology including expected competition, and
- project the expected market penetration of the technology.

In Proposal Section III.D, DOE requires the proposer to discuss the following points:

- the proposer's (or team member's) plan to penetrate the projected market and
- the proposer's commitment to subsequent commercialization.

5.4.1 Proposal Section III.A - Introduction

This section should describe briefly the anticipated commercial version of the proposed technology. This description should include all key features of the commercial embodiment of the technology, the expected size range, and interfaces with other equipment or processes. The proposer should include those features that differ from the demonstration project.

The proposer also should present a brief overview of expected market applications for the technology. This overview will serve to introduce the next two proposal sections (III.B and III.C).

5.4.2 Proposal Section III.B - Application to Existing Facilities

5.4.2.1 Reduction of the Emissions of Sulfur Dioxide and/or the Oxides of Nitrogen

DOE has developed a methodology that estimates the cost effectiveness and potential emission reductions achievable by the commercial version of the proposed technology when applied at existing facilities. DOE's methodology compares the proposed technology with commercially available technologies and estimates the following:

- the relative cost effectiveness of controlling SO2 and NOx emissions, on a unit basis,
- the total potential (nationwide) reduction of emissions, and
- the total potential reduction in transboundary transport of emissions.

For DOE to perform these analyses, every proposer must fill out the Worksheets in Appendix I. This information will provide estimated cost and performance data for application of a mature version of the proposed retrofit or repowering technology to a "reference" plant. One such reference that should be applicable to many proposed technologies is the hypothetical 500 MWe coal-fired electric utility plant which is described in detail in the Appendix. This reference plant is near the median, on an emissions basis, of the population of existing unscrubbed coal-fired utility boilers. An alternative hypothetical 250 MWe coal-fired utility plant also is described in Appendix I for those technologies which are more likely to be applied to smaller utility boilers.

DOE believes that the reference plants described in Appendix I should be appropriate for many of the proposed technologies. DOE recognizes, however, that these reference plants may not be appropriate for certain proposed technologies (e.g., technologies that are applicable only to coal-fired industrial processes, or to a specialized segment of the existing utility population such as small cyclone boilers). The proposer may, in these cases, or for any other reason, choose to provide a different reference plant. Any such alternative reference plant or facility provided by the proposer should be described and characterized in the same manner as the reference plants provided by DOE in Appendix I. In addition, for technologies where the intended market is other than utility or industrial/commercial, information about that market must be provided. The information must include present market size and a discussion of the dominant technologies in the market. As described in Appendix I, use of DOE's methodology for evaluating a proposed technology results in several "figures of merit," which are quantitative measures of how the proposed technology compares to a commercially available technology for emissions control. DOE will use these figures together with other attributes of the proposed technology, as described below, to complete the evaluation for Application to Existing Facilities.

Although DOE will analyze the potential for aggregate reductions of SO2 and/or NOx emissions and their transboundary transport, the proposer may wish to provide additional evidence, analysis, and discussion about potential reductions during the time frame from 1995 to 2010 or beyond. Special markets and applications for the technology and reasons for its particular suitability in certain situations should be explained.

If the technology is claimed to be capable of exceeding the percentage reductions of SO2 and/or NOx specified in the worksheets in Appendix I for other types of applications or operating conditions, the proposer should describe those applications and the performance. Discuss the range of process design variations, inherent advantages of the proposed technology, and control technology options available to improve environmental performance in a cost-effective manner. If appropriate, discuss how the percentage reductions of SO2 and/or NOx that will be achieved by the commercialized technology may vary with the commercial application, including coal type and composition, type of

facility, equipment design, operating conditions, and other relevant factors. Also indicate how operating costs and energy penalties may vary with operating conditions.

5.4.2.2 Other EHSS Impacts

The proposer must discuss the EHSS impacts (other than emissions of sulfur dioxide and the oxides of nitrogen) of the proposed technology in its commercial scale implementation. In this context, EHSS includes air quality and emissions, water quality and effluents, solid waste disposal, water resource requirements, health, safety and, if applicable, socioeconomic aspects. A discussion must be provided stating how expected environmental emissions, occupational or public exposure to waste streams, intermediate process streams or products, and byproducts produced by the proposed technology will meet or exceed the requirements of existing statutes and regulations. This discussion should include any aspects that may present a problem in achieving compliance.

Effluents and impacts should be described in terms of unit quantities per ton of feed coal and total quantities for a typical plant, as appropriate. This typical plant should be the reference plant used for providing the inputs to the information discussed in Section 5.4.2.1 and described in Appendix I. The following information should be specifically included, with quantities given in lb/MMBtu of feed coal unless otherwise stated:

- nonhazardous waste expected to be generated
- hazardous waste expected to be generated
- ash expected to be generated
- total particulates expected to be emitted
- sulfur compounds other than SO2 (e.g., SO3, H2S) expected to be emitted (lb sulfur/MMBtu of feed coal)
- total suspended solids in wastewater
- sulfur byproducts (e.g., sludge, sulfur, etc.)
- water consumption (gal/MMBtu of feed coal)

For those technologies which produce a product intended for use as a fuel or feedstock at another site, the proposer should address the expected environmental

performance of that fuel or feedstock in its anticipated use as well as the production facility.

The proposer should explicitly discuss the production and disposal of solid wastes and, if appropriate, their use or conversion to useful byproducts. If reductions of greenhouse gases (e.g., by improved efficiency) are anticipated in the commercialization of the technology at existing facilities, describe the extent and nature of these reductions.

5.4.3 Proposal Section III.C - Application to Future Energy Needs

Use of a commercial version of the proposed technology to address the nation's future energy needs should be addressed in this Section. This can be accomplished through application of the proposed technology to markets new to coal or through expanding the use of coal in existing markets. The proposer must discuss the cost effectiveness and EHSS impacts of the proposed technology in those market applications. To do this, the proposer must describe those potential markets both qualitatively and quantitatively. The major technologies expected to compete with the proposed technology in those markets must be identified. The projections, assumptions, and methodologies used by the proposer should be explained and justified. The following areas must be addressed:

- Quantitative Market Description -- The proposer must describe and estimate the size of the expected market, the portion that it projects its technology will capture during the period 1990-2020, and the time phasing of this penetration. In presenting this information, the proposer should break its total target market into homogeneous parts, insofar as is possible, to allow for more accurate analyses. The proposer may organize its presentation of market information as it deems most appropriate. Some guidelines offered are:

  - Foreign, domestic, and export markets should be presented separately.

- Any regional characteristics (climatic, regulatory, available infrastructure, etc.) that materially affect the economic competitiveness of the proposed technology should be identified and discussed separately.

- The proposer should assume that markets will develop in agreement with the Reference Case projections contained in Long Range Energy Projections to 2010, DOE, Office of Policy, Planning and Analysis, (DOE/PE-0082), July 1988.
(See Appendix P.)

Concerning the scale of the technology to be commercialized, the proposer must describe the range of sizes expected in commercial application and must discuss any special scaling aspects which may exist. Sizes should be specified by feedstock and product stream rates, energy output, or some other measure appropriate to the particular technology.

o Cost Effectiveness -- The proposer must provide certain cost information for DOE to evaluate the cost effectiveness of the proposed technology. Specifically, the proposer must:

  - present a qualitative analysis and discussion of the costs of the proposed technologies compared with the costs of the identified competing technology (e.g., capital requirements, cost of products, etc.);

  - select, define and discuss the means by which the cost effectiveness of the proposed technology will be measured (e.g., $/kwh, $/MMBtu, $/ton, $/bbl, etc.);

  - provide estimates of the capital cost and both the fixed and variable operating costs for a typical-size commercial application of the proposed technology; and

  - provide estimates of the cost of marketable products.

- EHSS Impacts -- Based upon the planned commercial applications of the Clean Coal Technology, the proposer must provide information about how New Source Performance Standards and other applicable EHSS statutes and regulations will be met in the commercial implementation of the technology. In this context, EHSS includes air quality and emissions, water quality and effluents, solid waste disposal, water resource requirements, health, safety and, if applicable, socioeconomic aspects. The proposer must discuss how anticipated environmental emissions, occupational or public exposure to waste streams, intermediate process streams or products, and byproducts produced by the proposed technology will meet or exceed the requirements of these statutes and regulations. This discussion should include whether there are any aspects that may present a problem in achieving compliance. This information should be presented for each market segment identified above.

  For technologies which produce a product intended for use as a fuel or feedstock at another site, the proposer should also address the expected environmental performance of that fuel or feedstock in its anticipated use.

  The proposer should discuss the production and disposal of solid wastes and, if appropriate, their use or conversion to useful byproducts. If there are expected reductions of greenhouse gases, compared to competing technologies (e.g., by improved efficiency) in the commercialization of the technology, describe the extent and nature of these reductions. If supplied in Proposal Section III.B, this information need not be duplicated here.

5.4.4 Proposal Section III.D - Commercialization Plan

The proposer must discuss how it intends to commercialize the proposed Clean Coal Technology in the 1990's. The discussion should define the proposer's role and the role of other parties in the commercialization process. Discuss all relevant business aspects in enough detail to show how the proposed demonstration

fits into the commercialization plan. All critical factors required to achieve commercialization, such as financing, licensing, engineering, manufacturing, and marketing, must be identified and addressed. Describe how any needed changes in infrastructure (including distribution, equipment servicing, etc.) that are necessary to achieve the commercialization will be accomplished and include a timetable for commercial development. If the technology owner intends to address foreign or export markets, the proposal should include a discussion of any special institutional or regulatory impediments that exist in the target markets. The commercialization plan must be consistent with the proposed rate of market penetration described below. This market need not be confined to the retrofit or repowering of existing facilities. The specific application(s) envisioned by the proposer should be identified.

As evidence of the proposer's commitment to the Commercialization Plan, the proposer should describe and explain the priority placed by the proposer for its parents' senior management (President, Chairperson of the Board, CEO, etc.) and the senior management of key project team members, including:

- how the proposed project fits into the proposer's overall business, marketing, or energy utilization strategy,
- the corporate investment in the technology to date, and
- specific statements by senior management showing commitment to the project and subsequent commercialization.

5.4.5 Proposal Section III.E - Exceptions, Deviations, and Assumptions

The proposer shall identify and explain exceptions, deviations, or conditional assumptions taken to the requirements of this Volume. Any exceptions, deviations, or conditional assumptions taken must contain enough explanation and justification to permit evaluation. Too many exceptions, or one or more significant exceptions, may result in rejection of the proposal as unacceptable. Selection of a proposal for negotiation will not be an indication that DOE accepts the exception, deviation, or conditional assumption contained in the proposal.

5.5 PREPARATION OF COST AND FINANCING PROPOSAL (VOLUME IV)

As noted in Section 4.4.3, the cost estimate plays a minor role in the evaluation of proposals submitted under this PON. Attention is called, however, to Section 6.1 which addresses the subject of information flow for successful proposals. Although the detail of the cost information requested in the PON is at a summary level, proposers should expect that a detailed cost estimate will be requested after selection. During the post selection process described in Section 6.1, an in-depth review will be made of this detailed cost estimate. At that time if the total project cost has increased over that requested in the original proposal, DOE will be under no obligation to increase the amount of DOE funding above that requested in the Cost Sharing Plan described below. It is, therefore, anticipated that proposers will give the cost estimate serious attention even though the level of detail in the proposal is lower than other requested information.

Complete the certification in Appendix H, Assurance of Compliance: Nondiscrimination in Federally Assisted Programs, and include it at the end of this Volume.

5.5.1. Proposal Section IV.A. - Cost Estimate

The level of detail in this Section should be appropriate to the planning stage of a project (See Section 6.1).

5.5.1.1 Format and Content

The estimated costs of the proposed project must be presented by using the formats established in Exhibits A and B of Appendix K. This presentation of the cost information must be consistent with the WBS for the proposed project and the proposed SOW. The proposed costs in Exhibit A should be expressed in whole dollars and summarized into estimated costs for the total project, individual phases, and tasks.

The SOW as developed by the proposer should define the entire scope of work for this project. It divides the work to be done into identifiable tasks which can

be scheduled and priced for the proposal and later be used for project control purposes. The SOW prepared for the Demonstration Project Proposal (Volume II) should provide the basis for the cost estimate. For the proposal the costs should be estimated to task level three. At this time cost information below level three of the WBS is not desired. As described in Section 6.1, however, cost details to lower levels of the WBS will be needed and should be ready for submission when requested after selection.

5.5.1.2 Cost Sharing Proposal

Exhibit C of Appendix K provides a form for the Cost Sharing Proposal. It provides a summary of both project cost and proposed cost share by phase and for the project. The proposer is reminded that the proposed cost share percentage by the proposer must be at least 50 percent in each phase and for the entire project. In determining allowable project costs and the Government's share of these costs, the cost sharing policies and guidelines discussed in Section 7 must be followed.

5.5.2 Proposal Section IV.B - Funding Plan, Capability to Fund the Demonstration

The proposer must submit a plan for funding the project for the period proposed in the SOW. The plan should identify the sources of project funds and show that these funds are sufficient for the duration of the project. The proposer also should discuss the degree of certainty that the funds identified in the plan will be available when required. This discussion should include a full description of any liabilities, limitations, conditions or other factors which could affect the availability of project funding.

If external (to the proposer or its parents) financing will be the source of project funds, the proposer should discuss the terms and conditions of such financing to the extent these are known. If no specific restrictions are known, the proposer should identify the general constraints on the acceptability of financing terms. The proposer shall show the degree to which such financing shall be available by submitting executed contractual agreements, certifications of private financing, letters of intent, or similar documentation. Additional

consideration will be given to executed financing arrangements and specific plans for providing for any potential funding shortfall.

If external financing for the project will be made final after selection, the proposer should describe the approach for securing the necessary financing. In addition, the proposer should provide a milestone schedule which shows, on a percentage basis of funds required, how and when such financing will be secured.

If the legal entity that will be the Participant does not exist at the time of submission of the proposal, the proposer should describe the timing of the entity's formation.

The proposer must provide current financial statements for all business quarters reported on in the current fiscal year, and audited financial statements for the most recent three fiscal years for each proposed source of equity financing and in-kind contributions to the project. If the Participant will come into existence before award, the proposer also must submit financial statements of the same type (audited annuals and unaudited quarterlies) and for the same periods (three most recent fiscal years) for each of the parent and predecessor organizations.

DOE is providing two checklists as an aid to proposers in completing Volume IV. Submission of all information contained in these checklists will help DOE in determining the reasonableness and adequacy of the proposer's funding/financing plan. Proposers are not limited to providing the checklist items and may submit additional information that the proposer believes will aid DOE in its determinations.

For the items on the checklist that follows, the proposer must complete the form, "Sources of Funds" provided in Appendix O:

- The extent to which the proposer, its parents or other project participants will contribute equity funds to the project and the source(s) of such funds.

- The nature and extent to which external financing will be required and sought and the prospective source(s) of such funds.

- The extent to which the proposer will seek state and local grants, loans, industry-sponsored research, or other funding; the source(s) of such funds.

- Schedule of project funding requirements. Indicate the proposer's and the Government's shares of the project cost for each phase of the project.

- State the dollar level of in-kind contributions.

The second checklist should aid the proposer to clarify important characteristics of the sources of funds contributed to the project:

- Discuss the extent to which external financing will be required and sought.

- The effect on the project of failing to obtain funds listed in the plan; also discuss possible alternative sources of funds.

- Whether the proposer or any other project participant will finance any portion of the required funds on a recourse basis.

- The types and estimated fair market value of assets (if any) that the proposer or such other participant will pledge as collateral for any outside financing.

- What entities will guarantee the financing.

- Proposed terms for repayment of any external financing.

- Expected rate regulatory treatment of the project (if appropriate) by state or Federal rate making agencies.

- Describe in-kind contributions and how they are to be valued. Show that equipment provided by a project team member and counted as cost-sharing is necessary for the completion of the SOW. (See Sections 7.2 and 7.3 for guidelines on valuation policies used in this PON. Description should be presented in Exhibit C of Appendix K.)

5.5.3 Proposal Section IV.C - Financial Commitment to the Project

The proposer should demonstrate the seriousness of its financial commitment to the project. Such evidence may include but not necessarily be limited to the following areas:

- The Government encourages cost sharing by the proposer of more than the 50% minimum as a sign of commitment. As a result, additional consideration will be given for proposer cost sharing above the minimum 50% required, particularly in the early phases of the project.

- The Government encourages the proposer to commit funds to the project for which the proposer (or its parents) is liable. Examples include funds generated internally by the parent(s) of the proposer and committed to the project, and financing where the holders have recourse against the proposer or its parents.

- The proposer should describe and explain the priority placed by the proposer's (or parents') senior management (President, Chairperson of the Board, CEO, etc.) and the senior management of key project team members on the project.

- The proposer should discuss its ability and willingness to cost share or wholly fund cost overruns.

5.5.4 Proposal Section IV.D - Exceptions, Deviations, and Assumptions

The proposer shall identify and explain exceptions, deviations, or conditional assumptions taken to the requirements of this Volume and the Model Cooperative Agreement. Any exceptions, deviations, or conditional assumptions taken must contain enough explanation and justification to permit evaluation. Too many exceptions, or one or more significant exceptions, may result in rejection of the proposal as unacceptable. Selection of a proposal for negotiation will not be an indication that DOE accepts the exception, deviation, or conditional assumption contained in the proposal.

6. GOVERNMENT MANAGEMENT PARTICIPATION

6.1 PROJECT INFORMATION FLOW

Successful proposers should note that award of a Cooperative Agreement requires a different level of information from that needed for selection. Soon after notice of selection, these proposers should expect that DOE will request the following information:

- a proposed Repayment Agreement based on the model in Appendix M,
- an updated technical description,
- updated environmental data including the information in Appendix J,
- an updated Funding Plan,
- a preliminary Project Management Plan,
- a detailed cost estimate (see Table 2),
- information concerning intellectual property particularly about technical data,
- more detailed site information, and
- audit data.

This information is necessary before award and to allow DOE to prepare for negotiation of the Cooperative Agreement.

As described in Section 6.3, it is DOE's intent that the first budget period of the Cooperative Agreement will be oriented toward baselining the project. In this regard much of the above information will be developed in more detail during the Project Definition Phase. To illustrate this increasing level of information detail, Table 2 describes the cost estimates at various project stages.

TABLE 2

COST ESTIMATE AT DECISION POINTS

PROPOSAL	AWARD	PROJECT DEFINITION PHASE
o (rough) flow diagram	o conceptual flow diagram	o process flow diagram
o (rough) heat and material balances	o conceptual heat and material balances	o heat and material balances
o comparison with known processes	o gross utility requirements	o preliminary P&I's
o published cost curves	o plot plans	o equipment list and specifications
o rough schedule	o "phone quotes" and historical data for individual items	o phone or written quotes from vendor (recent but not competitive)
o gross utility requirements	o factors for total installation including piping, electrical, structural, instrumentation, etc.	o detailed schedule
o historical data	o factors may be used for subsystems (e.g., coal feed, clean-up, etc.)	o bulk materials
		o preliminary engineering foundations, structures
		o layout and elevation drawings
		o one-line electricals
		o instrument list
		o piping specs
		o factored for total installation on bulk takeoffs
		o escalation

6.2 POST-SELECTION NEGOTIATIONS

If negotiations do not proceed in a timely manner, DOE may end negotiations (i.e., deselect that project). The circumstances under which DOE may deselect a project include, but are not limited to, the following:

- DOE determines that the prospective Participant is not meeting the agreed upon negotiation milestones.
- DOE determines that the prospective Participant is unable or unwilling to meet its financial commitment to the project.
- Negotiations reach an impasse.
- The proposed site is no longer available and an alternative site, acceptable to DOE, has not been identified.
- The prospective Participant withdraws its proposal.

6.3 PROJECT DECISION MAKING

DOE intends that the Participant will manage any project resulting from this PON; these projects will not be Government-directed. DOE must be in a position, however, to assure both the meeting of project goals and the proper use of public funds. As a result, the Government role in project execution is to monitor project activities, give technical advice, assess progress by periodically reviewing project performance with the Participant, and participate in decision making at major project junctures. Appendix L (the Model Cooperative Agreement) details the reporting requirements, the limits on DOE technical advice, and how DOE will treat sensitive and proprietary information.

The Model Cooperative Agreement also delineates the role that DOE will play in project decision making. Every project will be subdivided into several budget periods, each of which will end with a decision point. The exact number of budget periods will be determined on a case-by-case basis during negotiation.

At the start of each budget period, the Participant will deliver an Evaluation Plan for DOE's approval. This document will detail the expected progress for the upcoming budget period and will contain more detail than, but be consistent with, the Statement of Work in the Cooperative Agreement. At the end of each budget period, the Participant will deliver an Evaluation Report. This report will present a description of project progress. If the Participant intends to continue the project, it will also submit a Continuation Application at that time. If progress has been as planned (i.e., DOE accepts the Evaluation Report), DOE will not unreasonably withhold approval of the Continuation Application. The Evaluation Plan and Evaluation Report are not a requirement of the last budget period of the project.

The first budget period will be used to baseline the project and will have additional requirements. The project should have matured to the point that prudent planning allows for the implementation of proper management controls. In this regard the Evaluation Plan for the first budget period will include the accomplishment of at least the items listed below:

- Project Management Plan - the Plan described in the Model Cooperative Agreement will be prepared and delivered to DOE,
- Technology Baseline - all decisions about flowsheets, specific equipment types, equipment placement, and demonstration configuration will be made,
- Schedule Baseline - the schedule will be of sufficient detail to allow cost estimating to the level of detail discussed in Section 6.1,
- Cost Baseline - the estimate will be of the same detail as described in Section 6.1,
- Financing - all financial commitments pertaining to the Participant's share of total project costs will be signed, and

- NEPA - all requested information for DOE to satisfy its responsibility under the National Environmental Policy Act (see Section 3.26) will be submitted.

7. GOVERNMENT FINANCIAL PARTICIPATION

This section specifies the significant financial policies and guidelines upon which Government assistance under this PON will be determined.

7.1 AMOUNT OF COST SHARING REQUIRED

- DOE shall not finance more than 50 percent of the total costs of the project as estimated by DOE as of the date of award of financial assistance. In addition, the Participant must cost share at least 50 percent in Phase 1, "Design," Phase 2, "Construction," and Phase 3, "Operation."

- Costs will be shared between DOE and the Participant on an "as expended", dollar-for-dollar, basis (reconciled quarterly).

7.2 PROJECT COSTS NOT ALLOWED FOR COST SHARING PURPOSES

- DOE shall not accept valuation for property sold, transferred, exchanged, or manipulated in any way to acquire a new basis for depreciation purposes or to establish a rental value in circumstances which would amount to a transaction for the mere purpose of responding to this PON.

- Revenues or royalties from prospective operation of the project, beyond the time considered in the award of financial assistance (i.e., after the end of the Cooperative Agreement) or proceeds from the prospective sale of the assets of the project, or revenues or royalties from replication of the technology in future projects or plants, will not be considered cost sharing.

- The Model Cooperative Agreement authorizes the Participant to use program income (i.e., certain project revenues as defined at page L-3 of Appendix L) "for any purpose." Thus, the Participant may,

but is not required to, use program income to pay its share of project costs. In its Funding Plan (see, Appendix O,), however, the amount of estimated project revenues the proposer may offer as a source of funds can not exceed the Participant's share of variable operating costs that would be incurred during Phase 3 (Operation). Variable operating costs are those costs which are incurred only when the demonstration facility is actually being operated. Examples of such costs include consumed coal and water.

- Fully depreciated property will not receive any cost sharing value unless it has been in continuous use by the proposer during the entire calendar year 1988. (See Section 7.3, below.)

- Existing facilities, equipment, and supplies, or previously expended research or development funds are not cost sharing for the purposes of this PON, except as amortized, depreciated, or expensed in normal business practice (see Section 7.3, below). Contributions in the form of foregone revenues or replacement power costs are not considered as cost sharing.

- Patents, proprietary data, or prior work will not be valued in determining the proposer's cost participation in the project.

- The Participant may not charge allowable costs, which are absorbed into its share of cost participation, to the Federal Government under other contracts, agreements, or grants. Additionally, other appropriated Federal funds are not cost-sharing for the purposes of this PON except as provided in Pub. L. 100-446.

- The Participant can not consider foregone fee or profit for cost share purposes. The Government will not pay fee or profit to the Participant under the Cooperative Agreement.

7.3 ALLOWABLE PROJECT COSTS FOR COST SHARING PURPOSES

- Cost sharing by the proposer may be accomplished by a contribution of either direct or indirect costs provided such costs are otherwise allowed by the cost principles applicable to the award.

- Program income generated during Phase 3 may be used for cost-sharing. The Participant may plan to use such revenues for cost-sharing up to the extent that it does not exceed the variable costs of operation. Variable costs are those which are incurred only when the facility is in operation and generating products. Examples of such costs are consumed coal and water. An example of a cost which is otherwise allowable but is not a variable cost is labor expenses which would be incurred if the facility is in operation or not. Program income in excess of that needed for the Participant's share of variable operating costs may be used for any purpose.

- For fully depreciated property contributed to the project and in continuous use during the entire calendar year 1988, a fair use value for the life of the project will be assigned by DOE. The fair use value will be the annual average depreciation used by the proposer as permitted under statute or IRS regulations under which it was depreciated.

- The value that will be allowed for contributions of currently depreciating property and which are of relevance to the project proposed is the depreciation schedule being used and allowed under statute or IRS regulations for the property. This depreciation will be limited in its cost share value to the depreciation claimed during the life of the demonstration project.

- Contributed land will be valued at its fair rental value for the period of the demonstration.

- Contributed land, equipment and facilities will be counted as cost sharing only for the periods during which they are brought into use for this project. For example, that portion of a facility used for housing the design team may be credited as a cost share during Phase 1, but contributed equipment incorporated in the construction may be credited as a cost share only during those portions of Phases 2 and 3 when used. Property owned by one of the project team members and made available to the project will be valued according to the principles described above.

- Value for contributed equipment and facilities will be assigned only to the extent that the facility or equipment is project-related.

- The cost of disposal of the facility and equipment is an allowable cost if proposed and if accomplished during Phase 3 of the Cooperative Agreement.

- If DOE and the proposer execute a Cooperative Agreement, DOE will recognize as direct costs, the costs incurred to acquire and deliver the environmental information generated by the proposer during the period between selection and the award. Of this environmental information, only the information delivered to and accepted by DOE in satisfying the requirements of the post-selection site-specific NEPA process (see Appendix J) will be recognized for cost sharing purposes. For purposes of the preparation of the cost proposal, the proposer must assume that all post-selection site-specific NEPA process costs occur after award and are shared in proportion to the cost share ratio for the Project.

- The costs incurred between selection and award in the preparation of material reviewed and required by the Contracting Officer may be reimbursed in the same ratio as the cost share for the Project. This reimbursement will occur upon signing of the Cooperative Agreement.

7.4 RECOVERY OF GOVERNMENT'S INVESTMENT

Replication of the demonstrated technologies is the objective of the Clean Coal Program. It is the policy of the Government to require repayment of an amount up to (i.e., not to exceed) its actual contribution to the Project. Repayment will derive from those projects which are successful and achieve commercial application. Individual Repayment Agreements for each project will be negotiated. The following points will serve as the basis for these Agreements.

- The Government's right to recover its contribution shall continue until either the Government has recouped its contribution or 20 years have elapsed from the effective date of the Repayment Agreement (See Appendix M).

- The Repayment Agreement shall remain in effect unless the Secretary of Energy or designee determines that such repayment places the Participant at a competitive disadvantage in domestic or international markets. The Participant's request for this determination will not be considered before the effective date of the Repayment Agreement.

- Any unpaid amount remaining at the end of the 20 year period will be forgiven by the Government.

- Repayment shall only apply to that portion of the technology identified as being inside the technology envelope. This envelope should be the same as that used in the negotiated clauses dealing with Rights in Technical Data for large businesses. For small businesses where such technical data provisions are not included, the technical envelope for repayment will be defined during negotiations.

- Repayment will be generated only from the revenue sources specified in the negotiated Repayment Agreement (i.e., corporate assets are not pledged to the repayment).

- Repayment shall be based on the following potential sources of revenue arising from the commercialization of the demonstrated technology:

  - 1/2% of gross revenues from the sale or lease of equipment that is manufactured and embodies the demonstrated technology and

  - 5% of gross fees resulting from the licensing of the demonstrated technology.

- Successful proposers may provide an alternative plan during negotiations whereby any revenue source may be used to provide payment that, on an annual basis, is equivalent to the revenue which would be realized from the two sources listed above. Once the alternative plan has been agreed to, the Participant shall have the option to use the alternative plan as the sole basis for repayment or provide documentation on sales and licensing so that the amount repaid the Government shall not exceed, on an annual basis, the revenue realized from the above two sources.

- To promote commercialization, negotiators may agree that a grace period from repayment may be appropriate to facilitate introduction of the technology into the marketplace. This grace period may be for a set period, a certain number of facilities, or a certain number of licenses. The terms for any grace period shall be developed during negotiations but will not exceed five years or 10% of projected sales during the repayment period, whichever is less. The entire duration of any negotiated grace period will be part of the 20 year repayment period.

- o Repayment is limited to facilities and applications in the United States.

7.5 COST OVERRUNS

The Government is under no obligation to share any cost overruns. The Government however, may at its own discretion share in the cost of overruns, if funds are available. When funds are available and Federal assistance for overruns is provided, the Government share of overruns (i.e., costs incurred during the project that are more than those estimated at the date of award of the original financial assistance agreement) will not exceed the cost share for the project and then only up to 25 percent of the original Government contribution as specified in the initial financial assistance agreement.

7.6 PROJECT PROPERTY

The decision of whether to dispose of the facility at the end of the cost-shared project, or whether to continue operating the facility at the Participant's expense, is solely the responsibility of the Participant. Proceeds from the sale of project property may be retained by the Participant.

7.7 FINANCIAL RECORDS

Participants in Cooperative Agreements are required to maintain financial records adequate to reflect the nature and extent of their costs and to ensure that the required cost participation is achieved.

APPENDIX A

CONGRESSIONAL GUIDANCE

DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES APPROPRIATIONS, FISCAL YEAR 1989

DEPARTMENT OF ENERGY

CLEAN COAL TECHNOLOGY

For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 et seq., $575,000,000 shall be made available on October 1, 1989, and shall remain available until expended: *Provided,* That projects selected pursuant to a general request for proposals issued pursuant to this appropriation shall demonstrate technologies capable of retrofitting or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190 and 100-202 as amended by this Act.

The first paragraph under this head in Public Law 100-202 is amended by striking "and $525,000,000 are appropriated for the fiscal year beginning October 1, 1988" and inserting "$190,000,000 are appropriated for the fiscal year beginning October 1, 1988, and shall remain available until expended, $135,000,000 are appropriated for the fiscal year beginning October 1, 1989, and shall remain available until expended, and $200,000,000 are appropriated for the fiscal year beginning October 1, 1990": *Provided,* That outlays in fiscal year 1989 resulting from the use of funds appropriated under this head in Public Law 100-202, as amended by this Act, may not exceed $15,500,000: *Provided further,* That these actions are taken pursuant to section 202(b)(1) of Public law 100-119 (2 U.S.C. 909). 101 Stat. 1329-240.

For the purposes of the sixth proviso under this head in Public Law 99-190, funds derived by the Tennessee Valley Authority from its power program are hereafter not to be precluded from qualifying as all or part of any cost-sharing requirement, except to the extent that such funds are provided by annual appropriations Acts: *Provided,* That unexpended balances of funds made available in the "Energy Security Reserve" account in the Treasury for The Clean Coal Technology Program by the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in section 101(d) of Public Law 99-190, shall be merged with this account: *Provided further,* That for the purposes of the sixth proviso in Public Law 99-190 under this heading, funds provided under section 306 of Public Law 93-32 shall be considered non-Federal: *Provided further,* That reports on projects selected by the Secretary of Energy pursuant to authority granted under the heading "Clean coal technology" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, which are received by the Speaker of the House of Representatives and the President of the Senate prior to the end of the second session of the 100th Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading "Administrative provisions, Department Energy" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate. 42 USC 5903d note. Reports.

ADMINISTRATIVE PROVISIONS, DEPARTMENT OF ENERGY

Appropriations under this Act for the current fiscal year shall be available for hire of passenger motor vehicles, hire, maintenance, and operation of aircraft; purchase, repair, and cleaning of uniforms; and reimbursement to the General Services Administration for security guard services.

From appropriations under this Act, transfers of sums may be made to other agencies of the Government for the performance of work for which the appropriation is made.

None of the funds made available to the Department of Energy under this Act shall be used to implement or finance authorized price support or loan guarantee programs unless specific provision is made for such programs in an appropriations Act.

Gifts and property.

The Secretary is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, private, or foreign: *Provided*, That revenues and other moneys received by or for the account of the Department of Energy or

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otherwise generated by sale of products in connection with projects of the Department appropriated under this Act may be retained by the Secretary of Energy, to be available until expended, and used only for plant construction, operation, costs, and payments to cost-sharing entities as provided in appropriate cost-sharing contracts or agreements: *Provided further*, That the remainder of revenues after the making of such payments shall be covered into the Treasury as miscellaneous receipts: *Provided further*, That any contract, agreement, or provision thereof entered into by the Secretary pursuant to this authority shall not be executed prior to the expiration of 30 calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) from the receipt by the Speaker of the House of Representatives and the President of the Senate of a full and comprehensive report on such project, including the facts and circumstances relied upon in support of the proposed project.

Contracts. Reports.

The Secretary of Energy may transfer to the Emergency Preparedness appropriation such funds as are necessary to meet any unforeseen emergency needs from any funds available to the Department of Energy from this Act.

Notwithstanding 31 U.S.C. 3302, funds derived from the sale of assets as a result of defaulted loans made under the Department of Energy Alcohol Fuels Loan Guarantee program, or any other funds received in connection with this program, shall be credited to the Biomass Energy Development account, and shall be available solely for payment of the guaranteed portion of defaulted loans and associated costs of the Department of Energy Alcohol Fuels Loan Guarantee program for loans guaranteed prior to January 1, 1987.

Unobligated balances available in the "Alternative fuels production" account may be used for payment of the guaranteed portion of defaulted loans and associated costs of the Department of Energy Alcohol Fuels Loan Guarantee program, subject to the determination by the Secretary of Energy that such unobligated funds are not needed for carrying out the purposes of the Alternative Fuels Production program: *Provided*, That the use of these unobligated funds for payment of defaulted loans and associated costs shall be available only for loans guaranteed prior to January 1, 1987: *Provided further*, That such funds shall be used only after the unobligated balance in the Department of Energy Alcohol Fuel Loan Guarantee reserve has been exhausted.

100TH CONGRESS | HOUSE OF REPRESENTATIVES | REPORT
2d Session | | 100-862

MAKING APPROPRIATIONS FOR THE DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1989, AND FOR OTHER PURPOSES

AUGUST 10, 1988.—Ordered to be printed

Mr. YATES, from the Committee of conference, submitted the following

CONFERENCE REPORT

[To accompany H.R. 4867]

DEPARTMENT OF ENERGY

CLEAN COAL TECHNOLOGY

Amendment No. 131: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

In lieu of the matter proposed by said amendment insert the following: *For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 et seq., $575,000,000 shall be made available on October 1, 1989, and shall remain available until expended: Provided, That projects selected pursuant to a general request for proposals issued pursuant to this appropriation shall demonstrate technologies capable of retrofitting or repowering existing facilities and shall be subject to all provisos contained under this head in Public Laws 99-190 and 100-202 as amended by this Act.*

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate. The amendment provides $575,000,000 in fiscal year 1990 for a third Clean Coal Technology procurement as proposed by the Senate, and clarifies that the procurement is for retrofit and repowering technologies and is subject to the cost-sharing provisions of the previous two procurements.

The managers agree that a request for porposals should be issued by May 1, 1989, with proposals due no later than 120 days after issuance of the request for proposals, and that the Secretary of Energy should make project selections no later than 120 days after receipt of proposals.

Amendment No. 132: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate with an amendment as follows:

Restore the matter stricken by said amendment, amended to read as follow: *The first paragraph under this head in Public Law 100-202 ius amended by striking "and $525,000,000 are appropriated for the fiscal year beginning October 1, 1988" and inserting "$190,000,000 are appropriated for the fiscal year beginning October 1, 1988, and shall remain available until expended, $135,000,000 are appropriated for the fiscal year beginning October 1, 1989, and shall remain available until expended, and $200,000,000 are appropriated for the fiscal year beginning October 1, 1990": Provided, That outlays in fiscal year 1989 resulting from the use of funds appropriated under this head in Public Law 100-202, as amended by this Act, may not exceed $15,500,000: Provided further, That these actions are taken pursuant to section 202(bX1) of Public Law 100-119(2 U.S.C. 909).*

The managers on the part of the Senate will move to concur in the amendment of the House to the amendment of the Senate. The amendment changes the availability of $525,000,000 originally made available for fiscal year 1989 in Public Law 100-202 by making $190,000,000 available in 1989, $135,000,000 available in 1990, and $200,000,000 available in 1991 and also provides an outlay ceiling in fiscal year 1989. The House had proposed $100,000,000 in fiscal year 1989, $225,000,000 in fiscal year 1990, and $200,000,000 in fiscal year 1991, and the Senate struck the House language.

Both of these changes are necessary because of budget allocation constraints, but neither action has an effect on the execution of the Clean Coal program, or on the Congress' overall support for the program, as is evidenced by additional appropriations provided for a thrid procurement of technologies.

The managers agree that administrative contract expenses may be incurred up to the budget level of $9,820,000, but caution that close control of such expenditures is necessary to assure that the outlay ceiling provided will be sufficient to cover project costs.

Amendment No. 133: Modifies public law citation as proposed by the Senate.

Amendment No. 134: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which clarifies that funds borrowed by REA Electric Cooperatives from the Federal Financing Bank are eligible as cost-sharing in the clean coal technology program.

Amendment No. 135: Reported in technical disagreement. The managers on the part of the House will offer a motion to recede and concur in the amendment of the Senate which specifies clean coal projects may proceed 30 calendar days after receipt by Congress of required reports, provided the reports are received prior to the end of the 100th Congress.

Calendar No. 778

100TH CONGRESS } SENATE { REPORT
2d Session } { 100-410

DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES APPROPRIATIONS BILL, 1989

JULY 6, 1988—Ordered to be printed

Mr. BYRD, from the Committee on Appropriations, submitted the following

REPORT

[To accompany H.R. 4867]

DEPARTMENT OF ENERGY

CLEAN COAL TECHNOLOGY

1988 appropriation	$50,000,000
1989 budget estimate	[1] 525,000,000
House allowance	100,000,000
Committee recommendation	[1] 525,000,000

[1] Made by advance in Public Law 100-202.

The Committee recommends an appropriation of $525,000,000, the same as the budget estimate and an increase of $425,000,000 above the House allowance.

In addition, the Committee recommends an advance appropriation of $575,000,000 for fiscal year 1990, the same as the budget estimate for that year and an increase of $350,000,000 over the House allowance. The Committee has not, at this time, recommended advance appropri-

ations of $600,000,000 each for fiscal years 1991 and 1992 as requested by the administration. The Committee does expect to consider and fully appropriate these requested funds in a subsequent appropriation bill.

A table detailing the budget estimates and the recommendations of the multiyear Clean Coal Technology Program, as related to the joint envoys' report, is provided below:

(In thousands of dollars)

Fiscal year	Budget estimate	House allowance	Committee recommendation
Prior years	150,000	150,000	150,000
1988	50,000	50,000	50,000
1989	525,000	100,000	525,000
1990	575,000	225,000	575,000
1991	600,000	200,000	
1992	600,000		
Total	2,500,000	725,000	1,300,000

The appropriation recommended by the Committee for fiscal year 1990 is consistent with the President's request in his fiscal year 1989 budget to the Congress. The appropriation will enable the Secretary of Energy to conduct a third clean coal technology solicitation for demonstration projects pursuant to the authorities provided under the Federal Nonnuclear Energy Research and Development Act of 1974 (Public Law 93-577). This action is consistent with the President's decision to seek the full amount of the Government's share of funding recommended by the joint envoys on acid rain. This recommendation will provide total appropriations to date of $1,300,000,000 for demonstrations of innovative control technologies in concert with the envoys' report.

Selection of projects subsequent to the third Clean Coal Technology Program solicitation shall be based on the same criteria employed in the solicitation, as amended, that was released by the Department on February 22, 1988.

Within the overall funds provided for clean coal technology, the Committee understands that no more than $14,000,000 will be obligated for program direction expenses in fiscal year 1989.

The fiscal year 1988 appropriation (Public Law 100-202), which provided $50,000,000 along with advanced appropriations of $525,000,000 for fiscal year 1989, was directed to fund a second solicitation of clean coal technology demonstration projects primarily focused upon the demonstration of emerging clean coal technologies capable of retrofitting or repowering existing facilities.

The House has recommended that $425,000,000 of the fiscal year 1989 advanced appropriation be reappropriated in the following manner: $225,000,000 for fiscal year 1990 and $200,000,000 for fiscal year 1991. The Committee strongly opposes this recommendation.

While it is the Committee's understanding that such action, as recommended by the House, should not affect the authority of the Department of Energy to enter into contracts to obligate the total $525,000,-

000, along with the $50,000,000 appropriated in fiscal year 1988, for projects selected pursuant to the second solicitation now ongoing in the Department, the action of the House could send the private sector a very confusing signal as to the continued support of the Congress. Furthermore, by moving the majority of the advanced appropriations from fiscal year 1989 to fiscal years 1990 and 1991, budget ceilings in those latter fiscal years will be tightened just when decisions are required about additional appropriations for the clean coal program in order to fully fund the President's $2,500,000,000 clean coal program. Finally, this recommendation by the House could be interpreted by Canada as a clear signal that the United States does not intend to fund the clean coal program in amounts already promised nor to proceed with the program in the timeframe agreed upon.

The Committee is aware of the continuing debate over proposals to impose additional regulatory controls affecting the emission of air pollutants from the use of coal. The decision whether or not to impose such requirements should not prevent the development of new clean coal technologies which promise to permit the use of coal in a cost-effective and environmentally acceptable manner.

If the clean coal program were preempted because of the requirements of a new regulatory scheme, industry and the Nation would be left with current technology that is neither as efficient nor cost-effective in generating electricity or controlling emissions as many new clean coal technologies. Timely development and widespread use of new clean coal technologies, however, can provide the Nation with improved methods by which to achieve more effective emission reductions while providing less costly electricity to ratepayers or energy to industrial users of coal. Given a chance, DOE has estimated that new clean coal technologies could save consumers and business billions of dollars annually in lower electricity rates.

In May 1988, industry submitted 54 clean coal technology projects to the DOE totaling more than $5,300,000,000 in total project costs. Proposed projects would be located in 20 different States. Two-thirds of the submissions made to the DOE propose the demonstration of clean coal retrofit technologies and the other one-third of the submissions would demonstrate repowering technologies. Industry has also proposed to spend more than $3,000,000,000 in private funds, while seeking slightly more than $2,000,000,000 from the Government. With only $536,000,000 actually available for commitment to projects selected under this second solicitation, the clean coal projects already proposed by industry far exceed the amount of available funding. Clearly there is more than adequate private sector interest in additional clean coal technology demonstrations to justify the single $575,000,000 solicitation which the Committee is recommending for fiscal year 1990.

The Committee intends that a general request for proposals be issued no later than January 1, 1989. Proposals are due no later than 120 days after issuance of the request for proposals and the Secretary of Energy must make project selections no later than 120 days after receipt of proposals.

The Committee expects the Secretary to select projects that assure the demonstration of a diversity of technologies utilizing both high- and low-sulfur coals. Such project selections should not be confined to any specific geographic region of the country. While it is not the intent of the Committee to seek support for identical projects, the Committee understands from testimony received during congressional hearings that a particular technology may require multiple demonstrations of the same or similar technology at varying locations, using different coals, and involving different applications or equipment configurations. Design margins and equipment redundancy are systematically reduced as operational confidence and reliability are established. Succeeding projects of this nature are likely to entail fewer risks to the participants in the project as the technology evolves to one which has acceptable commercial risks. In this situation, such projects should require lesser amounts of Federal financial assistance.

In sum, the Committee intends that Government assistance may be provided to the extent necessary to assure the commercial maturity of various promising technologies so that new clean coal technologies will be available for use in the 1990's and beyond.

The Committee has retained House-passed bill language which makes it clear that a provision in Public Law 99–190, which requires at least 50 percent non-Federal cost sharing should not be construed to prevent the Tennessee Valley Authority from using its nonappropriated power authority revenues as cost sharing for projects under the Department's Clean Coal Technology Demonstration Program. Likewise, similar funds in other quasi-Federal operations are also eligible to be proposed as cost-sharing moneys under the sixth proviso of Public Law 99–190.

100TH CONGRESS | HOUSE OF REPRESENTATIVES | REPORT
2d Session | | 100-718

DEPARTMENT OF THE INTERIOR AND RELATED AGENCIES APPROPRIATIONS BILL, 1989

JUNE 20, 1988.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. YATES, from the Committee on Appropriations, submitted the following

REPORT

together with

ADDITIONAL VIEWS

[To accompany H.R. 4867]

DEPARTMENT OF ENERGY

CLEAN COAL TECHNOLOGY

The Committee recommends changing the availability of the $525,000,000 of funds made available for fiscal year 1989 in the fiscal year 1988 appropriation for clean coal technology, contained in Public Law 100-202. The recommendation would make $100,000,000 available in fiscal year 1989, make $225,000,000 available in fiscal year 1990 and make $200,000,000 available in fiscal year 1991. This change has no effect on the pace of the clean coal program, based on obligations anticipated by the Department of Energy. The Committee strongly supports this program and expects to give active consideration to additional appropriations in fiscal year 1990 and beyond to continue this important national effort.

While the Committee does not recommend additional advance appropriations for fiscal years 1990 through 1992 totaling $1,775,000,000 as requested by the Administration, neither this action, nor the change in availability of funds for the existing pro-

curement is to be interpreted as lack of support for the program. This action is necessary to comply with strict budget guidelines and will have no effect on the execution of the program. It is the Committee's intention to continue to support this program to the extent necessary to assure the introduction of new and efficient technology to burn coal cleanly in the 1990's and beyond.

In order to assure that Congress has sufficient information upon which to base future decisions with regard to program funding, the Committee expects the Department to provide a report by March 1, 1989 which at a minimum provides (1) a summary of the projects and technologies selected in each of the first two procurements; (2) the status of the selected projects; (3) a completion schedule for each project, including estimates of the timing of commercial availability of the technology assuming successful demonstration; and (4) an analysis of technology areas that are not represented sufficiently in the first two procurements.

In providing funds for clean coal technology in fiscal year 1986 and in fiscal year 1988, Congress provided that cost-sharing by individual projects, mandated to be no less than 50 percent, could not be made up of other Federally appropriated funds. It was assumed that this would not preclude the Tennessee Valley Authority (TVA), which did participate in the proposal process, from being able to use funds derived from receipts from its power program as cost-sharing if TVA so desired. Subsequently, a disagreement has arisen between TVA and DOE as to whether part of a 1985 Comptroller General's decision on a bid protest regarding a TVA contract affects the ability of TVA power funds to qualify for cost-sharing purposes under the clean coal program. TVA has been involved in many innovative coal technology programs and is a legitimate potential participant. Therefore, the Committee has included language in the bill to clarify that TVA power funds (except to the extent that any such funds were provided by an annual appropriations Act) are eligible to meet cost-sharing requirements under programs included within the "clean coal technology" account.

As requested by the Administration, the Committee recommends bill language providing for the merger of previously appropriated funds from the "Energy security reserve" with this account.

The Committee also expects administrative contract funds to be limited to $5,000,000 in fiscal year 1989 instead of $9,820,000. This reduced level is still one-third higher than 1988 estimates of requirements which were based on a larger program. These costs should be controlled closely so that most of the appropriations go directly to projects. If additional funds are required, they may be requested through the reprogramming process.

Public Law 100-202
100th Congress

Joint Resolution

Making further continuing appropriations for the fiscal year 1988, and for other purposes

Dec. 22, 1987
[H.J. Res. 395]

DEPARTMENT OF ENERGY

CLEAN COAL TECHNOLOGY

For necessary expenses of, and associated with, Clean Coal Technology demonstrations pursuant to 42 U.S.C. 5901 et seq., $50,000,000 are appropriated for the fiscal year beginning October 1, 1987, and shall remain available until expended, and $525,000,000 are appropriated for the fiscal year beginning October 1, 1988, and shall remain available until expended.

42 USC 5903d note.

No later than sixty days following enactment of this Act, the Secretary of Energy shall, pursuant to the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901 et seq.), issue a general request for proposals for emerging clean coal technologies which are capable of retrofitting or repowering existing facilities, for which the Secretary of Energy upon review may provide financial assistance awards. Proposals under this section shall be submitted to the Department of Energy no later than ninety days after issuance of the general request for proposals required herein, and the Secretary of Energy shall make any project selections no later than one hundred and sixty days after receipt of proposals: *Provided*, That projects selected are subject to all provisos contained under this head in Public Law 99-190: *Provided further*, That pre-award costs incurred by project sponsors after selection and before signing an agreement are allowable to the extent that they are related to (1) the preparation of material requested by the Department of Energy and identified as required for the negotiation; or (2) the preparation and submission of environmental data requested by the Department of Energy to complete National Environmental Policy Act requirements for the projects: *Provided further*, That pre-award costs are to be reimbursed only upon signing of the project agreement and only in the same ratio as the cost-sharing for the total project: *Provided further*, That reports on projects selected by the Secretary of Energy pursuant to authority granted under the heading "Clean coal technology" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, which are received by the Speaker of the House of Representatives and the President of the Senate prior to the end of the first session of the 100th Congress shall be deemed to have met the criteria in the third proviso of the fourth paragraph under the heading "Administrative provisions, Department of Energy" in the Department of the Interior and Related Agencies Appropriations Act, 1986, as contained in Public Law 99-190, upon expiration of 30 calendar days from receipt of the report by the Speaker of the House of Representatives and the President of the Senate.

Reports.

Public Law 99-190
99th Congress

Joint Resolution

Making further continuing appropriations for the fiscal year 1986, and for other purposes.

Dec. 19, 1985
[H.J. Res. 465]

DEPARTMENT OF ENERGY

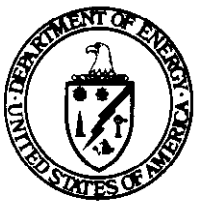
CLEAN COAL TECHNOLOGY

42 USC 5903d.

Within 60 days following enactment of this Act, the Secretary of Energy shall, pursuant to the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901, et seq.), issue a general request for proposals for clean coal technology projects for which the Secretary of Energy upon review may provide financial assistance awards. Proposals for clean coal technology projects under this section shall be submitted to the Department of Energy within 60 days after issuance of the general request for proposals. The Secretary of Energy shall make any project selections no later than August 1, 1986: *Provided,* That the Secretary may vest fee title or other property interests acquired under cost-shared clean coal technology agreements in any entity, including the United States: *Provided further,* That the Secretary shall not finance more than 50 per centum of the total costs of a project as estimated by the Secretary as of the date of award of financial assistance: *Provided further,* That cost-sharing by project sponsors is required in each of the design, construction, and operating phases proposed to be included in a project: *Provided further,* That financial assistance for costs in excess of those estimated as of the date of award of original financial assistance may not be provided in excess of the proportion of costs borne by the Government in the original agreement and only up to 25 per centum of the original financial assistance: *Provided further,* That revenues or royalties from prospective operation of projects beyond the time considered in the award of financial assistance, or proceeds from prospective sale of the assets of the project, or revenues or royalties from replication of technology in future projects or plants are not cost-sharing for the purposes of this appropriation: *Provided further,* That other appropriated Federal funds are not cost-sharing for the purposes of this appropriation: *Provided further,* That existing facilities, equipment, and supplies, or previously expended research or development funds are not cost-sharing for the purposes of this appropriation, except as amortized, depreciated, or expensed in normal business practice.

APPENDIX B

INTENTION TO PROPOSE



Department of Energy
Washington, DC 20585

APPENDIX B

INTENTION TO PROPOSE

PLEASE REVIEW THIS SOLICITATION. IN ORDER THAT WE CAN UPDATE OUR "SOURCE LIST," PLEASE COMPLETE THE ENTRIES BELOW, AND DETACH AND RETURN THIS PAGE BY THE EARLIEST PRACTICABLE DATE.

WE

___ DO INTEND TO SUBMIT A PROPOSAL.
___ DO NOT INTEND TO SUBMIT A PROPOSAL FOR THE FOLLOWING REASONS:

_____

_____

_____

COMPANY NAME: _____

AUTHORIZED SIGNATURE: _____

TYPED OR PRINTED NAME AND TITLE: _____

DATE: _____

RETURN THIS PAGE TO:

DEPARTMENT OF ENERGY
OFFICE OF PROCUREMENT OPERATIONS (MA-452.1)
CONTRACT OPERATIONS DIVISION "A"
ROOM NUMBER 1I-065
1000 INDEPENDENCE AVENUE, S.W.
WASHINGTON, D.C. 20585

ATTN: HERBERT D. WATKINS

PROGRAM OPPORTUNITY NOTICE NO. DE-PS01-89FE61825

FORM DOE-PO-IP-578

APPENDIX C

PROPOSAL COVER SHEETS

Volume I: Qualification Proposal
Volume II: Demonstration Project Proposal
Volume III: Commercial Concept Proposal
Volume IV: Cost and Financing Proposal

Volume I - Qualification Proposal

U.S. Department of Energy
Program Opportunity Notice
Clean Coal Technology III

for DOE use

PROPOSAL COVER SHEET

1. Copy Number:

2. Technology: _____

3. Project Title: _____

4. Proposer Name(s): _____

5. Proprietary Information: Does this submittal contain proprietary or business-confidential information?:

Check - yes ☐ no ☐

If your answer is YES, insert the "Notice re Restrictions on Disclosure and Use of Data" (provided in the Program Opportunity Notice) in the space below:

NOTICE RE RESTRICTIONS ON DISCLOSURE AND USE OF DATA

Volume II - Demonstration Project Proposal

U.S. Department of Energy
Program Opportunity Notice
Clean Coal Technology III

for DOE use

PROPOSAL COVER SHEET

1. Copy Number:

2. Technology: _____

3. Project Title: _____

4. Proposer Name(s): _____

5. Proprietary Information: Does this submittal contain proprietary or business-confidential information?:

Check - yes ☐ no ☐

If your answer is YES, insert the "Notice re Restrictions on Disclosure and Use of Data" (provided in the Program Opportunity Notice) in the space below:

NOTICE RE RESTRICTIONS ON DISCLOSURE AND USE OF DATA

Volume III - Commercial Concept Proposal

U.S. Department of Energy
Program Opportunity Notice
Clean Coal Technology III

for DOE use

PROPOSAL COVER SHEET

1. Copy Number:

2. Technology: _____

3. Project Title: _____

4. Proposer Name(s): _____

5. Proprietary Information: Does this submittal contain proprietary or business-confidential information?:

Check - yes ☐ no ☐

If your answer is YES, insert the "Notice re Restrictions on Disclosure and Use of Data" (provided in the Program Opportunity Notice) in the space below:

NOTICE RE RESTRICTIONS ON DISCLOSURE AND USE OF DATA

Volume IV - Cost and Financing Proposal

U.S. Department of Energy
Program Opportunity Notice
Clean Coal Technology III

for DOE use

PROPOSAL COVER SHEET

1. Copy Number:

2. Technology: _____

3. Project Title: _____

4. Proposer Name(s): _____

5. Proprietary Information: Does this submittal contain proprietary or business-confidential information?:

Check - yes ☐ no ☐

If your answer is YES, insert the "Notice re Restrictions on Disclosure and Use of Data" (provided in the Program Opportunity Notice) in the space below:

NOTICE RE RESTRICTIONS ON DISCLOSURE AND USE OF DATA

APPENDIX D

QUALIFICATION CRITERIA CERTIFICATIONS

Qualification Criterion Certification

COST SHARE PERCENTAGES

I, the undersigned authorized representative for _____
(name of organization)

_____, for the proposal entitled _____

_____,

(proposal title)

now being submitted to the U.S. Department of Energy for financial assistance pursuant to Program Opportunity Notice DE-PS01-89FE61825, do hereby certify that the proposer's share of the costs involved in the proposed demonstration will be at least 50 percent of the total costs of the demonstration. Furthermore, the proposer will cost share to the extent of at least 50 percent in each of the three phases: Phase 1, "Design," Phase 2, "Construction," and Phase 3, "Operation."

_____ _____
Date Name of Proposer

_____ _____
Signature of Authorized Representative

Typed Name and Title of Authorized Representative

Qualification Criterion Certification

PROJECTED REPAYMENT SCHEDULE

I, the undersigned authorized representative for _____
(name of organization)

_____, for the proposal entitled _____

_____,
(proposal title)

now being submitted to the U.S. Department of Energy for financial assistance pursuant to Program Opportunity Notice DE-PS01-89FE61825, do hereby certify that, if selected for negotiation of a cooperative agreement, a Projected Repayment Plan will be prepared for the proposed project and submitted to the Department of Energy.

_____	_____
Date	Name of Proposer
_____	_____
Signature of Authorized Representative	Typed Name and Title of Authorized Representative

APPENDIX E

PUBLIC ABSTRACT FORM

Clean Coal Technology Round #3

Page # ____

Proposal # ____
(Proposer should leave blank)

Public Abstract

Proposer (primary) name: _____

Address: _____ _____ ____ _____
Street City State Zipcode

Team members (if any):
[Listing represents only participants at time of proposal, not necessarily final team membership]

_____ _____ ____ _____
Name City State Zipcode

_____ _____ ____ _____
Name City State Zipcode

_____ _____ ____ _____
Name City State Zipcode

Project Title: _____

Project Type:
(Check appropriate boxes)

☐ **Retrofit** ☐ **Repowering** ☐ **New fuel form**

☐ **Other, specify** _____

Technology Type: (Check one or more in each box)

☐ **Sulfur reduction only**

☐ **Nitrogen oxide reduction only**

☐ **Sulfur and nitrogen oxide reduction**

☐ **Other,** _____
Specify

☐ **Precombustion cleaning**

☐ **Combustion or combustion modification**

☐ **Postcombustion stack gas cleanup**

☐ **Conversion (gasification, liquefaction, coprocessing, etc.)**

☐ **Other** _____
Specify

Projected total cost of project:
(May not represent final negotiated costs)

Total estimated cost: $ _____

Estimated DOE share: _____

Estimated private share: _____

Can be expressed either as estimated dollar figures or as approximate percentages

Public Abstract (cont'd)

Page # ☐

Proposal # ☐
(Proposer should leave blank)

Anticipated project site(s):

_____ ____ _____
Location (city, county, etc.) State Zipcode

_____ ____ _____
Location State Zipcode

_____ ____ _____
Location State Zipcode

Type of coal to be used:

_____ _____
Primary Alternate (if any)

Size or scale of project:

_____
Tons of coal/day **input**

and/or

_____ Megawatts,
Barrels per day, etc.
Other (if necessary)

Duration of proposed project: _____
[From date of award] (Months)

For additional information, interested parties should contact:

_____
Name

_____
Position

( )
_____
Telephone number

_____
Company

_____
Address

_____ _____ _____
City State Zipcode

Brief description of project:
[750 words or less]

(Use next page if necessary)

Public Abstract (cont'd)

Page # [ ]

Proposal # [ ]

(Proposer should leave blank)

Brief description of project (cont'd):

APPENDIX F

PROJECT SUMMARY FORM

(page number)

U.S. Department of Energy
Program Opportunity Notice
for
Clean Coal Technology III
Demonstration Projects

PROJECT SUMMARY FORM

for DOE use

(proposal no.)

1. Technology: _____

2. Project Title: _____

_____

_____

_____

3. Proposer Name(s): _____

_____

_____

_____

4. Proposer Address: _____

_____

Street: _____

City: _____ State: ___ Zip: _____

5. Primary Contact: _____

Title: _____

Telephone No: ( ) ___ - ____

6. Proj. Location: _____

_____

7. County(ies): _____

8. Applications: _____

_____

_____

9. Types of Coal to be Used: _____

10. Coal Source: _____

_____

11. Project Size (Coal use rate or other measure of project size): ___Ton/Hr
MWe
etc.

12. Proposed Duration of Each Project Phase (in months):

Phase 1	Phase 2	Phase 3
_____	_____	_____

13. Proposed Project Total Duration (in months): _____

14-17. Estimated Total Project Costs (including both Proposer and Government):

	Phase 1	Phase 2	Phase 3		Total Project
16. Proposed Cost:	$_____	$_____	$_____	(14)	$_____
17. Proposer Share:	__%	__%	__%	(15)	__%

18. Project Team Members:

(a) Name or Corporate Identity: _____

_____

Street: _____

City: _____ State: _____ Zip: _____

(b) Name or Corporate Identity: _____

_____

Street: _____

City: _____ State: _____ Zip: _____

(c) Name or Corporate Identity: _____

_____

Street: _____

City: _____ State: _____ Zip: _____

(Attach a page if needed to list additional members)

APPENDIX G

AUTHORIZATION

GENERAL INSTRUCTIONS FOR THE SF-424

This is a standard form used by applicants as a required facesheet for preapplications and applications submitted in accordance with OMB Circular A-102. It will be used by Federal agencies to obtain applicant certification that states which have established a review and comment procedure in response to Executive Order 12372 and have selected the program to be included in their process have been given an opportunity to review the applicant's submission.

APPLICANT PROCEDURES FOR SECTION I

Applicant will complete all items in Section I with the exception of Box 3, "State Application Identifier." If an item is not applicable, write "NA." If additional space is needed, insert an asterisk "*," and use Section IV. An explanation follows for each item:

Item

1. Mark appropriate box. Preapplication and application are described in OMB Circular A-102 and Federal agency program instructions. Use of this form as a Notice of Intent is at State option. Federal agencies do not require Notices of Intent.

2a. Applicant's own control number, if desired.

2b. Date Section I is prepared (at applicant's option).

3a. Number assigned by State.

3b. Date assigned by State.

4a-4h. Legal name of applicant, name of primary organizational unit which will undertake the assistance activity, complete address of applicant, and name and telephone number of the person who can provide further information about this request.

5. Employer Identification Number (EIN) of applicant as assigned by the Internal Revenue Service.

6a. Use Catalog of Federal Domestic Assistance (CFDA) number assigned to program under which assistance is requested. If more than one program (e.g., joint funding), check "multiple" and explain in Section IV. If unknown, cite Public Law or U.S. Code.

6b. Program title from CFDA. Abbreviate if necessary.

7. Use Section IV to provide a summary description of the project. If appropriate, i.e., if project affects particular sites as, for example, construction or real property projects, attach a map showing the project location.

8. "City" includes town, township or other municipality.

9. List only largest unit or units affected, such as State, county, or city.

10. Estimated number of persons directly benefiting from project.

11. Check the type(s) of assistance requested.

   A. Basic Grant—an original request for Federal funds.

   B. Supplemental Grant—a request to increase a basic grant in certain cases where the eligible applicant cannot supply the required matching share of the basic Federal program (e.g., grants awarded by the Appalachian Regional Commission to provide the applicant a matching share).

   E. Other. Explain in Section IV.

12. Amount requested or to be contributed during the first funding/budget period by each contributor. Value of in-kind contributions should be included. If the action is a change in dollar amount of an existing grant

Item

(a revision or augmentation under item 14), indicate only the amount of the change. For decreases, enclose the amount in parentheses. If both basic and supplemental amounts are included, breakout in Section IV. For multiple program funding, use totals and show program breakouts in Section IV. 12a—amount requested from Federal Government. 12b—amount applicant will contribute. 12c—amount from State, if applicant is not a State. 12d—amount from local government, if applicant is not a local government. 12e—amount from any other sources, explain in Section IV.

13b. The district(s) where most of action work will be accomplished. If city-wide or State-wide, covering several districts, write "city-wide" or "State-wide."

14. A. New. A submittal for project not previously funded.

   B. Renewal. An extension for an additional funding/budget period for a project having no projected completion date, but for which Federal support must be renewed each year.

   C. Revision. A modification to project nature or scope which may result in funding change (increase or decrease).

   D. Continuation. An extension for an additional funding/budget period for a project with a projected completion date.

   E. Augmentation. A requirement for additional funds for a project previously awarded funds in the same funding/budget period. Project nature and scope unchanged.

15. Approximate date project expected to begin (usually associated with estimated date of availability of funding).

16. Estimated number of months to complete project after Federal funds are available.

17. Complete only for revisions (item 14c), or augmentations (item 14e).

18. Date preapplication/application must be submitted to Federal agency in order to be eligible for funding consideration.

19. Name and address of the Federal agency to which this request is addressed. Indicate as clearly as possible the name of the office to which the application will be delivered.

20. Existing Federal grant identification number if this is not a new request and directly relates to a previous Federal action. Otherwise, write "NA."

21. Check appropriate box as to whether Section IV of form contains remarks and/or additional remarks are attached.

APPLICANT PROCEDURES FOR SECTION II

Applicants will always complete either item 22a or 22b *and* items 23a and 23b.

22a. Complete if application is subject to Executive Order 12372 (State review and comment).

22b. Check if application is not subject to E.O. 12372.

23a. Name and title of authorized representative of legal applicant.

FEDERAL AGENCY PROCEDURES FOR SECTION III

Applicant completes only Sections I and II. Section III is completed by Federal agencies.

26. Use to identify award actions.

27. Use Section IV to amplify where appropriate.

28. Amount to be contributed during the first funding/budget period by each contributor. Value of in-kind contributions will be included. If the action is a change in dollar amount of an existing grant (a revision or augmentation under item 14), indicate only the amount of change. For decreases, enclose the amount in parentheses. If both basic and supplemental amounts are included, breakout in Section IV. For multiple program funding, use totals and show program breakouts in Section IV. 28a—amount awarded by Federal Government. 28b—amount applicant will contribute. 28c—amount from State, if applicant is not a State. 28d—amount from local government, if applicant is not a local government. 28e—amount from any other sources, explain in Section IV.

29. Date action was taken on this request.

30. Date funds will become available.

31. Name and telephone number of agency person who can provide more information regarding this assistance.

32. Date after which funds will no longer be available for obligation.

33. Check appropriate box as to whether Section IV of form contains Federal remarks and/or attachment of additional remarks.

☆ GPO : 1984 O - 461-275 (277)

APPENDIX H

ASSURANCE OF COMPLIANCE:
NONDISCRIMINATION IN FEDERALLY ASSISTED PROGRAMS

DOE F 1600.5
(5-85)

OMB NO. 1900-0400

U.S. Department of Energy

Assurance of Compliance

Nondiscrimination in Federally Assisted Programs

_____ (Hereinafter called the "Applicant") HEREBY AGREES to comply with *Title VI of the Civil Rights Act of 1964* (Pub. L. 88-352), *Section 16 of the Federal Energy Administration Act of* 1974 (Pub. L. 93-275), Section 401 of the Energy Reorganization Act of 1974 (Pub. L. 93-438), Title IX of the Education Amendments of 1972, as amended, (Pub. L. 92-318, Pub. L. 93-568, and Pub. L. 94-482), Section 504 of the Rehabilitation Act of 1973 (Pub. L. 93-112), the Age Discrimination Act of 1975 (Pub. L. 94-135), Title VIII of the Civil Rights Act of 1968 (Pub. L. 90-284), the Department of Energy Organization Act of 1977 (Pub. L. 95-91), and the Energy Conservation and Production Act of 1976, as amended, (Pub. L. 94-385). In accordance with the above laws and regulations issued pursuant thereto, the Applicant agrees to assure that no person in the United States shall, on the ground of race, color, national origin, sex, age, or handicap, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity in which the Applicant receives Federal assistance from the Department of Energy.

Applicability and
Period of Obligation

In the case of any service, financial aid, covered employment, equipment, property, or structure provided, leased, or improved with Federal assistance extended to the Applicant by the Department of Energy, this assurance obligates the Applicant for the period during which Federal assistance is extended. In the case of any transfer of such service, financial aid, equipment, property, or structure, this assurance obligates the transferee for the period during which Federal assistance is extended. If any personal property is so provided, this assurance obligates the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant for the period during which the Federal assistance is extended to the Applicant by the Department of Energy.

Employment Practices

Where a primary objective of the Federal assistance is to provide employment or where the Applicant's employment practices affect the delivery of services in programs or activities resulting from Federal assistance extended by the Department, the Applicant agrees not to discriminate on the ground of race, color, national origin, sex, age, or handicap, in its employment practices. Such employment practices may include, but are not limited to, recruitment, recruitment advertising, hiring, layoff or termination, promotion, demotion, transfer, rates of pay, training and participation in upward mobility programs; or other forms of compensation and use of facilities.

Subrecipient Assurance

The Applicant shall require any individual, organization, or other entity with whom it subcontracts, subgrants, or subleases for the purpose of providing any service, financial aid, equipment, property, or structure to comply with laws cited above. To this end, the subrecipient shall be required to sign a written assurance form, however, the obligation of both recipient and subrecipient to ensure compliance is not relieved by the collection or submission of written assurance forms.

Data Collection and
Access to Records

The Applicant agrees to compile and maintain information pertaining to programs or activities developed as a result of the Applicant's receipt of Federal assistance from the Department of Energy. Such information shall include, but is not limited to,the following: (1) the manner in which services are or will be provided and related data necessary for determining whether

any persons are or will be denied such services on the basis of prohibited discrimination; (2) the population eligible to be served by race, color, national origin, sex, age and handicap; (3) data regarding covered employment including use or planned use of bilingual public contact employees serving beneficiaries of the program where necessary to permit effective participation by beneficiaries unable to speak or understand English; (4) the location of existing or proposed facilities connected with the program and related information adequate for determining whether the location has or will have the effect of unnecesarily denying access to any person on the basis of prohibited discrimination; (5) the present or proposed membership by race, color, national origin, sex, age and handicap, in any planning or advisory body which is an integral part of the program; and (6) any additional written data determined by the Department of Energy to be relevant to its obligation to assure compliance by recipients with laws cited in the first paragraph of this assurance.

The Applicant agrees to submit requested data to the Department of Energy regarding programs and activities developed by the Applicant from the use of Federal assistance funds extended by the Department of Energy. Facilities of the Applicant (including the physical plants, buildings, or other structures) and all records, books, accounts, and other sources of information pertinent to the Applicant's compliance with the civil rights laws shall be made available for inspection during normal business hours on request of an officer or employee of the Department of Energy specifically authorized to make such inspections. Instructions in this regard will be provided by the Director, Office of Equal Opportunity, U.S. Department of Energy.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts (excluding procurement contracts), property, discounts or other Federal assistance extended after the date hereto, to the Applicants by the Department of Energy, including installment payments on account after such data of application for Federal assistance which are approved before such date. The Applicant recognizes and agrees that such Federal assistance will be extended in reliance upon the representations and agreements made in this assurance and the the United States shall have the right to seek judicial enforcement of this assurance. This assurance in binding on the Applicant, its successors, transferees, and assignees, as well as the person whose signature appears below and who is authorized to sign this assurance on behalf of the Applicant.

_____
(Date)

_____

_____
(Name of Applicant)

_____

_____
(Address)

_____
(Authorized Official)

( ) _____
(Applicant's Telephone Number)

APPENDIX I

THE DOE COST AND ENVIRONMENTAL PERFORMANCE METHODOLOGY

DOE Methodology for Evaluating the Commercial Potential of Retrofit and Repowering Technologies to Reduce Emissions of SO2/NOx

1. SUMMARY

DOE has developed a method to make a quantitative estimate of the commercial potential of technologies to reduce SO2 and NOx emissions from existing facilities. The method is used to provide figures of merit to assist in evaluating retrofitting and repowering technologies that are proposed as a means of mitigating emissions of acid rain precursors from coal-fired boilers that have no SO2 or NOx emission controls at present. To employ the method, it is necessary to have cost and performance information for the technology to be evaluated over the range of plant sizes and coal sulfur contents that cover the intended use of the technology. By performance is meant the extent to which SO2 and/or NOx emissions are avoided compared to the case with no controls. Levelized costs are computed for the expected lifetime of a process unit using capital and operating cost components. For each proposed technology DOE computes relations for performance and levelized cost as functions of unit capacity and, where appropriate, coal sulfur content from data supplied in this Appendix.

Two main types of technologies are distinguished, those applied at sites remote from individual boilers, and those applied at the boiler site. The former are denoted as coal processing technologies. The product(s) of a coal processing plant may be used at one or several boiler sites, and there is no *a priori* relationship between the size of a coal processing plant and the size(s) of the coal-burning facilities that use the fuel product(s).

The size and capacity of equipment designed to retrofit or repower individual boilers or boiler clusters at particular sites depend directly on the size of the original coal-fired facility. Most steam coal consumed in the U.S. is burned by electric utilities, and extensive data bases are available describing each utility boiler in recent service and its operation. For instance, among other data available for each utility boiler are its capacity, age, and firing type. Also known are annual values for the composition and amount of coal burned, tons of SO2 and NOx emitted, and capacity factor. In 1985 there were 929 operational coal-fired utility boilers without SO2 emission controls. These boilers have a combined name plate capacity of 241 GW, and in 1985 had combined emissions of

SO2 and NOx of over 18 million tons. Together these boilers constitute the largest source of acid rain precursors addressed by the Joint Report of the Special Envoys on Acid Rain, also known as the "Lewis/Davis Report."

1.1 Benchmark Technologies

For the purpose of the present evaluation, DOE can estimate in a consistent manner the cost of installing and operating a proposed retrofit or repowering technology on each of the 929 boilers. Furthermore, DOE can make a consistent quantitative estimate of the annual reduction of SO2 and/or NOx that would result, boiler by boiler, with installation of the proposed technology, and for repowering technologies, the amount of additional power generated. As explained below, proposed technologies that are applicable to coal-fired utilities are evaluated by use of a data base for the 929 utility boilers. Other proposed technologies are subjected to a similar analysis based on the intended market application. For all proposed technologies, the input data required by DOE to perform the analysis is obtained from the proposer via a set of worksheets contained in the present Appendix.

Boiler-specific computations of cost and performance are not used directly to evaluate proposed technologies. Rather, proposed technologies are first compared to commercially available technologies with similar performance characteristics for acid gas control. Rationale for the comparison step is that a proposed technology is of interest for commercial development if it can achieve a larger percentage removal of a pollutant and/or removes the pollutant at a lower cost than commercially available technologies.

The comparison, or "benchmark" commercial technology that is used as a comparison to a proposed technology varies with the acid gas removed (SO2, NOx, or both) and with the intended service of the proposed technology. For example, for utility applications of powdered coal combustors, the benchmark technology for NOx removal is low-NOx burners (LNB). The benchmark technology for SO2 removal for the same application is wet limestone scrubbing (FGD). For industrial/commercial applications, the benchmark technology for SO2 removal is dual alkali flue gas scrubbing. The benchmark technologies represent commercially proven state of the art for emission control from coal-fired boilers.

Evaluation of technologies applicable to utilities proceeds as follows. For each

of the 929 boilers in the utility data base DOE decides whether the proposed technology is applicable and then estimates the annual tons of SO2 and/or NOx that would be removed if the proposed retrofit technology were installed. The cost, in dollars per ton of pollutant removed, is also calculated. In an analogous manner to that used to establish cost/performance relationships for proposed technologies, DOE has established similar relationships for the benchmark technologies. Thus, for each of the 929 boilers in the data base DOE can also compute the tons of acid gases removed and the cost with use of benchmark technologies.

1.2 Figures of Merit; Evaluation of Boiler Site Retrofits

For evaluation of retrofit technologies applicable at the boiler site of utilities, four figures of merit are computed from a comparison between the proposed and benchmark technologies at each boiler site in the data base where the proposed technology is applicable. For the purpose of the present analysis, a proposed technology is termed "cost effective" if it can remove an acid gas at a particular boiler site at a lower average cost, in dollars per ton, than the benchmark technology. This leads to the first figure of merit, called "tons removed cost effectively", which is the total annual tons removed at a boiler site by a proposed technology that is cost effective. A second figure of merit is the difference between the average removal cost,in dollars per ton, of the benchmark technology and that of the proposed technology. This figure is called "dollars saved per ton."

High percentage removal of SO2 and/or NOx is a desirable feature for control strategy purposes, although it is to be expected that the average removal cost will usually increase as the percentage acid gas removal increases. In recognition of this, third and fourth figures of merit are computed for the proposed technology. The third figure of merit is intended to measure any higher percentage removal of SO2 or NOx that the proposed technology may achieve compared with the benchmark even if its average removal cost is higher than that of the benchmark. This figure of merit is the difference between the tons of SO2 or NOx removed by the proposed technology less that removed by the benchmark. This figure is called "excess tons removed." Finally, a fourth figure of merit is used to measure the additional cost of achieving higher than benchmark removal when the proposed technology has higher cost as well as higher percentage removal. It is defined as the difference between the average removal cost of

the proposed technology less that of the benchmark technology. This figure is called the "premium cost per ton."

The second and fourth figures of merit are identically defined (with a change of sign), but the second comes into play when the proposed technology has lower cost than the benchmark, while the fourth is used when the proposed technology achieves greater removal than the benchmark. A proposed technology is better the higher its scores for the first three figures of merit and the lower its score for the fourth.

Summary values for all four figures of merit are computed for a proposed technology by use of the entire data base for boiler sites. The first and third figures of merit are simply summed over all boilers in the data base. Summary values for the second and fourth figures of merit, having units of dollars per ton, are computed by weighting the values at each boiler site by the proper factor. The factor is tons of SO2 or NOx removed cost effectively for the second figure, and tons of excess SO2 or NOx removed for the fourth figure. Values of the summary figures of merit are used in the evaluation of proposed technologies. Figures of merit are computed for both SO2 and NOx.

1.3 Evaluation of Repowering Technologies

For evaluating repowering technologies, a similar approach is used. Here it is necessary to factor in expected growth in power demands as well as economic comparison between proposed and benchmark technologies. This is accomplished by using projections of demand growth by power pool as published in the 1985 National Energy Policy Plan (NEPP). A proposed repowering technology is considered as the means of providing additional power requirements for each power pool over the time period 1995 to 2010. For each pool, generating capacity is measured against projected demand as a function of time. At the time when new generating capacity is required, it is determined if there are one or more boilers that are repowering candidates in the power pool. If the answer is affirmative, the cost of providing the power by the proposed technology is computed. Also computed is the cost of providing the power by a greenfield installation of the benchmark technology, a PC-fired combustor equipped with LNB and FGD, and using coal that had been treated by conventional cleaning. If the proposed technology is less expensive, it is credited with the repowering installation. The simulation of the power pool then continues to march forward

in time in similar fashion until the year 2010 is reached.

In comparing the proposed repowering technology with the benchmark technology, identical quantities of power are assumed to be generated by both technical approaches (i.e. repowered or greenfield plant) at each site that is a candidate for repowering. Differences in cost of the two technical approaches are attributed to cost of air pollution control for purposes of the analysis. At any site where repowering is less expensive than a greenfield installation, the annual savings over the expected life of the plant are computed. Annual tons of avoided acid gas emissions due to the repowering technology are also computed. Using the same system as has been described for retrofits at the boiler site, this value, tons removed cost effectively, represents the first site-specific figure of merit. Division of annual savings by annual tons of avoided emissions yields the second-site specific figure of merit, dollars saved per ton.

If the repowering technology avoids emission of more SO2 or NOx than the benchmark, the difference expressed in annual tons is the third site-specific figure of merit, excess tons removed. The fourth site-specific figure of merit, premium cost per ton, is computed as described for retrofits. Summary figures of merit for the entire data base are computed for SO2 and NOx as described for retrofits.

1.4 Evaluation of Industrial/Commercial Applications

For industrial/commercial applications of coal-fired boilers, characteristics of the market are not known with the same detail as for utilities. Nevertheless, DOE uses a similar approach to that described above for evaluating technologies proposed for industrial/commercial applications. Costs and tons of SO2 or NOx removed are computed for use of the proposed technology for steam raising with emission control. Similar calculations are made using the benchmark technology to achieve the same end. This information is used as has been described to compute figures of merit for the proposed technology.

1.5 Characteristics of Coal Processing Technologies

For the purpose of this evaluation, coal processing will be treated in the same manner as a retrofit technology. Examples are advanced coal cleaning, coal liquefaction, and mild gasification. Coal processing plants produce one or more

fuels from coal that may be transported to one or more sites for combustion. Usually the fuels produced have a lower sulfur content than the feed coal. Use of such fuels represents an alternative path to retrofits applied at the boiler site for reducing SO2 emissions from existing facilities. Sometimes it is necessary to modify facilities at the site of use to permit substitution of a new fuel form for the fuel previously employed.

Some coal processing technologies can be successfully applied to a wide range of U.S. coals. Examples include gasification and both direct and indirect liquefaction. Other coal processing technologies are designed to treat only certain kinds of coals. Advanced coal cleaning technologies directed toward pyrite removal find most use in treating Eastern coals, which have relatively high pyrite contents. Thermal/pyrolytic technologies directed toward increasing specific calorific content, destruction of pyrophoric properties, or improving structural stability of the feed coal are applied to low-rank coals including lignite.

For any coal processing technology to play a significant role in reducing SO2 emissions from existing facilities, its fuel product must have access to the greater part of the total market. Because of the regional distribution of low-rank and high-rank coals and of coal consumption in the U.S., the manner in which technologies that process the two ranks of coals address the market will differ. High-rank coals and coal burning facilities are concentrated east of the Mississippi; low-rank coals are located predominantly in the West. Coal processing technologies directed toward high-rank coals advantageously are able to treat coals having a wide range of sulfur contents extending upwards of 3 percent. Transportation costs for the fuel product(s) are less important in determining economic competitiveness than they are for the products of low-rank coal processing, due to the proximity of coal sources and markets. Low-rank coal processors have the advantage of using a feedstock with a low sulfur content.

1.6 Evaluation of Coal Processing Technologies

In view of these differences, DOE evaluates low-rank and high-rank coal processing technologies differently . As for clean coal technologies applied at the boiler site, evaluation proceeds by performing a comparison between the proposed technology and a benchmark technology at each boiler site in the data base. The benchmark for both types of coal processing technology is the same.

DOE distinguishes between the ways the two kinds of coal processing technologies will compete for market share, however.

Coal processing technologies directed towards high-rank coals are evaluated as follows. The proposer is asked to describe cost and process performance of the proposed technology on a range of U.S. steam coals of varying sulfur content. The proposer must also provide data to allow DOE to calculate costs incurred, if any, for modifying existing facilities to use the fuel produced.

In an analogous manner to that previously described, DOE uses the information supplied by the proposer to calculate cost of emission abatement and annual tons of avoided emissions by applying the proposed technology to each boiler in the data base. In performing this calculation, DOE assumes that the feed coal to the coal processing plant that produces fuel for a particular boiler is the same coal that is currently combusted in that boiler. Cost of transporting the product of coal processing plants to boiler sites is treated by using the cost of delivered coal in the analysis. DOE also computes the cost and environmental performance of a benchmark technology for controlling SO2 emissions from each boiler. The benchmark technology is wet limestone FGD. Calculations for the benchmark technology are made using the coals currently combusted in each boiler. Site-specific and summary figures of merit are computed for the proposed technology as described above.

Coal processing technologies directed to low-rank coals are evaluated as follows. The proposer is required to identify the coal seam and its location for one coal feedstock it considers to be most advantageous for use in its process. The proposer describes cost and process performance of the proposed technology with the selected coal. Data are given to calculate any costs incurred in modifying boilers for use of the new fuel form. DOE estimates transportation costs for the processed fuel from the region producing the selected coal to each of the boiler sites in the data base. DOE also calculates cost and environmental performance for use of the processed fuel at each boiler site. Transportation of the processed fuel to the boiler site is considered to be an operating cost.

As stated previously, the benchmark technology for evaluating SO2 removal by low-rank coal processing is the same as for high-rank: feed coals employed at individual boiler sites are treated by wet limestone FGD.
Site-specific and summary figures of merit are computed for both types of coal

processing technologies as described.

2. ORGANIZATION OF WORKSHEETS

The Department of Energy (DOE) will evaluate the life cycle costs for mature versions of the technologies proposed under the Clean Coal Technology Solicitation as use for retrofit or repower applications. DOE has developed worksheets to assist in completing this evaluation. The purpose of these worksheets is to obtain projections from the offeror for the technical, environmental, and economic performance of mature, fully-commercial versions of the proposed technology.

A basis for comparison is established by requiring that each offeror apply an extrapolated, mature version of his technology (or combined technologies) to a reference plant(s). Conceptual design details of reference plants that are expected to be appropriate for many offerors are provided in Attachment A of this Appendix: a reference 500 MWe coal-fired utility plant. Since the reference 500MWe scale may not be the most relevant for some proposed technologies, data for an alternative reference 250 MWe power plant are also provided in the Attachment. These data are found contained within brackets, [data], throughout the Attachment. In addition, Table 3A and Figures 2A, 3A, 4A, and 5A are provided to document the alternative reference 250 MWe power plant configuration. It is recognized that performance and cost parameters for clean coal technologies in retrofit or repower applications are site specific because of the interfaces between the new equipment and the existing plant. However, the reference plants are defined in order to ensure a degree of uniformity. Application of the proposer's technology to the reference plant(s) will result in a "base case" design. Information needed to compute costs of installing the technology at different size plants and with use of various coals is provided by the proposer in optional Worksheet 6 of this Appendix. The offeror is reminded that if a different reference plant is more appropriate for the proposed technology, it should be provided by the offeror and documented at a comparable level of detail to the power plant provided in this Appendix.

As detailed more fully in the Attachment, proposers of technologies installed at the boiler site are to describe use of their technology with a reference coal. Analysis of the reference coal is given in Table 2 of the Attachment.

Proposers of coal processing technologies are required to develop two sets of data. One set describes the characteristics of the 750 tph coal processing plant, and the second describes the use of the principal coal-derived fuel in the base case power plant. Information describing how cost and performance of the coal processing technology depends on feed coal characteristics is provided by the proposer in optional Worksheet 6.

Blank copies of the worksheets to be filled in and submitted to DOE as part of the proposal are provided in this Appendix. Also included are instructions for completing the worksheets.

3. COAL PROCESSING TECHNOLOGIES

3.1 Reference Coal Processing Plant Specifications

The unique feature of technologies that perform coal processing is the lack of need for the coal processing plant scale to be consistent with that of the power plant. Indeed, economics usually dictate that one coal processing plant serve multiple power plants (and sometimes even other markets). As a consequence of the scale inconsistency, the commercialized version of a proposed remote coal processing approach is given to be a new, 750 tph input, proposer defined, coal processing plant. It is assumed that there is an adequate market for the entire output of the coal processing plant, even though only a portion of its output is utilized by the base case power plant. The power plant may buy as much fuel as it needs (up to the total output of the processing plant) at the product fuel cost. Consequently, DOE requests that the proposer define a configuration and develop cost and performance data for a 750 ton per hour processing plant (i.e., not a modification of an existing plant).

The total facility to be defined by the proposer should produce a coal-derived fuel suitable for combustion in the reference power plant boiler without further treatment. Land requirements should be estimated for the coal processing facility and the cost of the land should be included with the capital costs. Proposers whose product fuel cannot be directly fired in the reference power plant must consider the additional costs that will be incurred in converting the power plant to use their fuel. Examples of such fuel forms could include coal-water slurries and liquid hydrocarbons. Power plant modifications could include 60-day storage facilities, necessary transfer equipment and modifications to the

boiler, as required. These costs are to be computed only as applicable to the reference 500 [250] MWe power plant described in Section 3.1.

3.2. Coals Used as Feedstock to Coal Processing Technologies

The manners in which coal processing technologies for treating high-rank and low-rank coals will be evaluated have been described in Section 1. Technologies for processing high-rank coals are to use the reference coal described in Table 2 of the Attachment as the feedstock for their 750 ton per hour plant. Proposers of technology to process low-rank coals must specify a coal for use as feedstock. This is done in Worksheet 1B.

3.3 Coal Washability Data

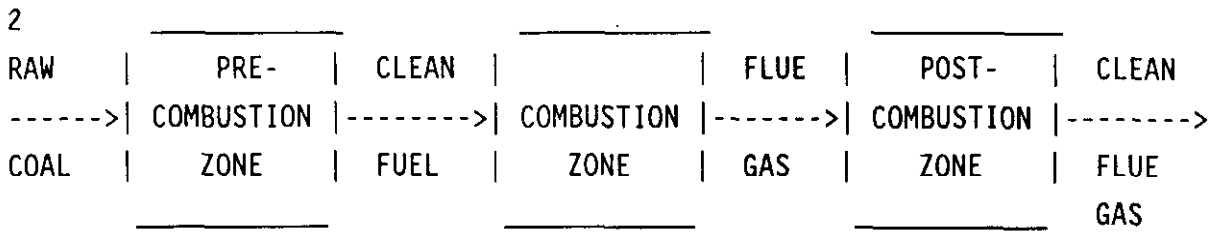
Chemical analysis of the reference coal as a function of coal size is provided in Table 7, and detailed washability data is provided in Tables 8, 9, and 9A of the Attachment. Proposers of high-rank coal processing technology that have use for this type of data should use these Tables. Proposers of low-rank coal processing technology that have need of this type of data must provide similar information for their selected coal. This information, together with identification of its origin, must be provided as part of the submission for Worksheet 3.

4. TECHNOLOGY CLASSIFICATION

DOE recognizes that many different types of technologies and combinations of technologies can be applied to reduce the acid rain precursor emissions from existing facilities. In order to facilitate the evaluation process, DOE distinguishes between retrofit technologies and repowering technologies.

4.1 Retrofit Technologies

Retrofit technologies may entail fuel modification or add emission control equipment to existing plants but do not result in additional capacity nor do they extend boiler life. Figure 1 provides examples of retrofit technologies.



Physical Cleaning	Advanced Combustor	Duct-Injection
Chemical Cleaning	Low NOx Burners	Wet FGD
Biological Cleaning	Furnace Sorbent Injection	SCR
Liquefaction	Gas Reburning	Combined NO_x/SO_x FGT
Beneficiated CWS		FGD Enhancements
Gasifier Refueling		Spray Drying

FIGURE 1. Definition of Retrofit Technology Categories

Retrofitting requires no specific levels of SO_2 and NO_x control for a technology (or system of technologies), but presumes that the level of reduction will typically equal or exceed 50 percent. The proposer should develop a design which is believed to represent the technology's most cost-effective or competitive emission control level.

4.2 Repowering Technologies

Repowering involves replacing an existing plant's aging boiler with new, fluidized-bed combustion, gasification, or other technology. A repowered coal-fired plant would retain much of its steam cycle and virtually all of its electrical generating and power conditioning hardware. However, these components would be refurbished simultaneously with the repowering and result in increased plant life. Repowering technologies include atmospheric fluidized-bed combustion (AFBC), pressurized fluidized-bed combustion (PFBC), integrated gasification combined-cycle (IGCC), and other repowering configurations. Repowering improves emission control and can improve plant operability. Repowering configurations involving combined gas and steam turbine systems typically also increase the plant's electrical generation capacity and efficiency.

5. INSTRUCTIONS FOR COMPLETING WORKSHEETS

Worksheets are provided by DOE to obtain descriptive information and cost data from the proposers for their technologies. This section provides the guidance and instructions for completing the blank worksheets.

The number and kind of worksheets that each proposer must complete depends on the type of clean coal technology being proposed. In this regard, all proposals are considered to fall in one of five categories as follows:

- On-site Retrofit:
  Refers to retrofit technologies applied to the reference power plant.

- Repowering
  Refers to repowering technologies applied to the reference power plant.

- Processing of High-rank Coal
  Refers to processing high-rank coal remote from the reference power plant site.

- Processing of Low-rank Coal
  Refers to processing low-rank coal remote from the reference power plant site.

- Coal Processing with On-site Retrofit / Repowering
  Refers to a combination of technologies applied both remote from, and on the reference power plant site. Technologies applied at <u>both</u> sites must result in reductions of SO_2 and/or NOx emissions, for example coal cleaning with duct injection of sorbent.

Table 1 below lists all the worksheets contained in this Appendix. It also indicates the number of each worksheet that a proposer must complete according to category of proposed technology. The number "1" entered in Table 1 means that a particular worksheet must be completed once, either for the reference power plant or for the 750 tph coal processing plant. The number "2" entered in the Table means that the particular worksheet must be filled out twice, once for the plant on each site. A blank space indicates the worksheet is not required.

Proposers of repowering or retrofit technologies applied at the power plant site must complete a Worksheet 3 for each major plant section in which new equipment is installed. Proposers of coal processing technologies must complete a Worksheet 3 for each major section of the new 750 tph plant.

Note that the parameters requested on the following worksheets are on different bases for repowering and for retrofit technologies. Values entered for repowered plants should be on the basis of a "whole plant" after the modification has been completed. Values entered for retrofitted plants should be "incremental values" associated with the installation of the retrofit technology unless specifically noted otherwise.

On the following pages, blank worksheets are presented. Detailed instructions for completing the worksheets are found in the Attachment.

TABLE 1

WORKSHEET REQUIREMENTS BY TECHNOLOGY CATEGORY

WORKSHEET NUMBER/TITLE		ON-SITE RETROFIT	REPOWERING	COAL PROCESSING (HIGH- OR LOW-RANK)	COAL PROCESSING WITH ON-SITE RETROFIT/REPOWERING
1A	General Description of Retrofit and Repowering Technologies	1	1	1	1
1B	General Description of Coal Processing Plant	---	---	1	1
2	Block Flow Diagram	1	1	2	2
3	Description of Major Plant Sections	Variable	Variable	Variable	Variable:both plants
4A	Equipment Costs for Retrofitted Power Plant	1	---	1	0 or 1
4B	Equipment Costs for Repowered Power Plant	---	1	---	1 or 0
4C	Costs for New 750 tph Remote Coal Processing Plant	---	---	1	1
5	Power Plant Economic Summary	1	1	---	1
6	Cost and Performance Variation with Plant Size and Operating Variables	1	1	---	1

WORKSHEET 1A
General Description of
Mature Version of Retrofit and Repowering Technologies

PROPOSER'S NAME: _____

TECHNOLOGY DESCRIPTION: _____

_____

_____

PLANT PERFORMANCE SUMMARY[1]

		Reference Plant	After Clean Coal Technology
1.	Coal or New Fuel Feed Rate , tph (Basis: As Received)	196 [98]	
2.	Emissions, lb/MMBtu		
	SO_2	3.8	
	NO_x as NO_2	1.2	
	Particulate Matter	0.10	
3.	Rated Output Power Production, MWe		
	Total Gross	536.0 [268.0]	
	Total Net	509.5 [254.8]	
4.	Net Heat Rate[2] (Basis: HHV), Btu/kWh	9,493	
5.	Plant Availability[3] Factor, %	75	

6. For Retrofit Technologies:

A. Indicate if Technology is in Pre-Combustion, Combustion, and/or Post-Combustion Processing Zone: _____

_____

B. Emission Control Specifications, % Reduction:

Emission	Pre-Combustion	Combustion	Post-Combustion	Overall
SO_2	____%	____%	____%	____%
NO_x	____%	____%	____%	____%

1 Full load design conditions.
2 Plant boundary fuel input to busbar electricity.
3 Fraction of year (8760 hours) the plant is "available" to produce power at some useful output level (excludes planned or unplanned shutdowns).

TECHNOLOGY: _____
PROPOSER'S NAME: _____

WORKSHEET 1B
General Description of Coal Processing
(Applies Only to Processing of Coal at a Site Remote from the Power Plant)

TECHNOLOGY DESCRIPTION: _____

PLANT PERFORMANCE SUMMARY[1]

	Input to Coal Processing	Output of Coal Processing
1. Coal Feed or New Fuel Product		
Coal Feed and Product Rates, tph	750	
Fuel Higher Heating Value, Btu/lb		
Fuel Sulfur Content, wt %		
Fuel Sulfur Content, lb/MMBtu		
2. Feed and Product Characteristics (Proximate Analysis, wt %)		
Fixed Carbon		
Volatile Matter		
Ash		
Moisture		
3. % Yield (ton/ton feed, dry basis)		
4. % Btu Recovery Based on HHV		
5. Sulfur-containing gases emitted during processing, lb S/10^6 Btu of product		
6. Plant Annual Availibility[2] Factor, %		
7. Plant Construction Time, Days		
8. Total Annual Output, Tons (dry basis)		
9. Product a Slurry? (Y/N)		
Wt % of Solids if a Slurry		

10. (Identification and Description of Feedstock Coal)

[1] All coal compositions on an as-received basis, except as noted.
[2] Fraction of year (8760 hours) the plant is "available" to process coal at some useful rate (excludes planned or unplanned shutdowns).

TECHNOLOGY: _____

PROPOSER'S NAME: _____

WORKSHEET 2
Block Flow Diagram Showing Major Plant Sections
After Clean Coal Technology Modifications

TECHNOLOGY: _____

PROPOSER'S NAME: _____

WORKSHEET 3
Description of Major Plant Sections in
Block Flow Diagram on Worksheet 2

Section Name:

_____

Process Description: _____

_____

_____

_____

Key Design Criteria: _____

_____

_____

_____

Process Sequence: _____

_____

_____

_____

Existing Equipment Mods: _____

_____

_____

_____

Operating Requirements:	QTY/HR	TYPE
Thermal (i.e. steam)	_____	_____
	_____	_____
Parasitic Power	_____	_____
Consumables (i.e. fuels, chemicals, water)	_____	_____
	_____	_____
	_____	_____
	_____	_____
Products (i.e. waste, power, chemicals)	_____	_____
	_____	_____
	_____	_____
	_____	_____

TECHNOLOGY: _____

PROPOSER'S NAME: _____

WORKSHEET 4A

TOTAL INSTALLED EQUIPMENT COSTS FOR RETROFITTED POWER PLANT

(1) Plant Section	(2) Plant Section Title	(3) Unadjusted New Plant Installed Equipment Cost, MM$	(4) Process Contingency Factor	(5) Adjusted New Plant Installed Equipment Cost, MM$
100	Non-Coal Material Feed and Handling			
200	Coal Preparation and Storage			
300	Fuel Oxidant Feed and Handling			
400	Combustion/Steam Generation			
500	Fuel Gas Processing and Handling			
600	Power Generation			
700	SO_2 Removal Unit			
800	NO_x Removal Unit			
900	Particulate Removal			
1000	Flue Gas Ducting and Fans			
1100	Sorbent Regeneration			
1200	By-Product Processing and Handling			
1300	Chimney or Stack			
1400	Waste Handling			
1500	Balance of Plant			
1600	Other Areas[1]			
	Totals, MM$			
	Retrofit Difficulty Factor			
	Total Retrofit Installed Equipment Cost, MM$			

[1]Utilized only if equipment location is not identified in the above list

TECHNOLOGY: _____

PROPOSER'S NAME: _____

WORKSHEET 4B
TOTAL INSTALLED EQUIPMENT COST FOR REPOWERED POWER PLANT

(1) Plant Section	(2) Plant Section Title	(3) Unadjusted New Plant Installed Equipment Cost, MM$	(4) Process Contingency Factor	(5) Adjusted New Plant Installed Equipment Cost, MM$	(6) Equipment Utilization Factor	(7) Unadjusted Installed Equipment Cost, MM$
Totals, MM$						
Retrofit Difficulty Factor						
Total Retrofit Installed Equipment Cost, MM$						

TECHNOLOGY: _____
PROPOSER'S NAME: _____

WORKSHEET 4C
TOTAL COSTS FOR NEW, 750 TPH, REMOTE, COAL PROCESSING PLANT

1. Capital Costs, MM $

(1) Plant Section	(2) Plant Section Title	(3) Installed Equipment Costs	(4) Process Contingency Factor	(5) = (3 X 4) Capital Costs
100	Raw Materal Feed and Handling System (Excludes Fuel)			
200	Fuel Preparation and Storage System			
210	Coal Receiving and Storage			
220	Dense Media Recovery and Ash Conveyor			
230	Coal Screening			
240	Coarse Coal Separation			
250	Fine Coal Separation			
260	Intermediate Coal Separation			
270	Dewatering and Drying			
280	Clean Coal Storage and Handling			
1500	Common Support Systems			
1600	Other Equipment			
1700	Land			
1800	Other "Proposer Defined" Sections			

2. Total Capital Costs, MM $ _____

3. Project Contingency Allowance, MM $ _____

4. Engineering, Home Office, General Facilities and Royalities, MM $ _____

5. Interest During Construction _____

6. Working Capital, MM $ _____

7. Total Plant Investment, MM $ _____

8. Total Annual Maintenance Cost, MM $ _____

9. Total Annual Fixed O&M Cost, MM $ _____

10. Total Variable Cost (Including Profit), $/HR _____

11. (Transportation costs of fuel produced at low-rank coal processing plant)

WORKSHEET 5
POWER PLANT ECONOMIC SUMMARY

Technology: _____
Proposer's Name: _____

Capital Item	Capital Requirement, MM$
(A) Process Area Capital (Worksheet 4A or 4B)	
(B) Total Plant Cost	
(C) AFDC, Construction Interest and Price Escalation Enter construction period ____ years	
(D) Total Plant Investment	
(E) Royalty Allowance	
(F) Preproduction Cost	
(G) Inventory Capital	
(H) Initial Catalyst and Chemicals	
(I) Total Capital Cost	

Operating and Maintenance Item	O&M Requirement
(J) Variable Operating Cost, $/hr	
(K) Annual Maintenance Cost, MM$	
(L) Annual Operating Labor Cost, MM$ Enter number of operators/shift: ____	
(M) Annual Fixed O&M Cost, MM$	

Worksheet 1: General Description of Clean Coal Project

Worksheet 1A requests a general description of a mature commercial version of the proposed retrofit or repowering technology as applied to the reference power plant. The requested data are for the whole plant after modification (i.e., incremental values are not to be provided for a retrofit technology). All proposers must complete Worksheet 1A. For proposers of coal processing technologies, items 1-5 are to describe operation of the reference power plant using the process-derived fuel. In item 7B, the percent reductions requested for each processing zone are based on the uncontrolled emissions of the unmodified reference plant.

Worksheet 1B requests similar information for a coal processing plant and is applicable only if the proposed technology involves the pre-combustion treatment of coal at a site remote from the power plant. See the items to be completed in the column labeled "Input to Coal Processing." The requested values are for the reference coal and can be found in Table 2 for proposers of high-rank coal processing technology. For proposers of low-rank coal processing, the requested values are for the coal specified by the proposer.

For coal processing technologies that release one or more sulfur-containing gases to the atmosphere during processing, the amount of emitted sulfur per million BTU of fuel *product(s) must be recorded on* Worksheet 1B.

Proposers of low-rank coal processing must attach an addendum to Worksheet 1B. In the addendum the coal to be used as a process feedstock must be specified. The specification must include the coal seam, its location, and salient characteristics of the coal. Characterization of the coal should follow the form of Table 2 in the Attachment. Evidence must also be presented that commercially significant reserves of the specified coal are available for use.

Worksheet 2: Block Flow Diagram (Showing Major Plant Sections)

On Worksheet 2, block flow diagrams describing the major plant sections in which new equipment is installed in the "as modified" power plant and/or the major plant sections of the new coal processing plant, as applicable, are to be provided. At a minimum, the flow diagrams should describe the interconnections of the major sections in the plant, flow rates of major feed and effluent streams from the plant, as well as

temperatures and pressures of major streams between blocks. A set of plant section definitions for the block flow diagrams should be selected, as applicable, from Tables 2 through 5. Within a table of section definitions, only those sections relevant to the proposed technology are to be utilized. Table 2 applies to retrofit technologies and off-site processing of coal. In the event a technology applicable to a remote site coal processing plant is proposed, two versions of Worksheet 2 are to be completed (i.e., one for the coal processing plant and one to reflect any effects on, or modifications to, the power plant). Tables 3, 4, and 5 apply to, respectively, PFBC repowering, AFBC repowering, and IGCC repowering. If a repowering technology not addressed in Tables 3, 4, or 5 is proposed, the proposer shall complete Worksheet 2 for the proposed technology, providing information at a level of detail similar to that listed in Tables 3 through 5.

TABLE 2

List of Major Sections in Retrofitted and/or Coal Processing Plant

Section	Definition
100	Non-Coal Feed and Handling
200	Coal Preparation and Storage
210	Coal Receiving and Storage (coal preparation only)
220	Dense Media Recovery and Ash Conveyor (coal preparation only)
230	Coal Screening (coal preparation only)
240	Coarse Coal Separation (coal preparation only)
250	Fine Coal Separation (coal preparation only)
260	Intermediate Coal Separation (coal preparation only)
270	Dewatering and Drying (coal preparation only)
280	Clean Coal Storage and Handling (coal preparation only)
300	Fuel and Oxidant Feed and Handling
400	Combustion/Steam Generation
500	Fuel Gas Processing and Handling
600	Power Generation
700	SO_2 Removal Unit
800	NO_x Removal Unit
900	Particulate Removal
1000	Flue Gas Ducting and Fans
1100	Sorbent Regeneration
1200	By-Product Processing and Handling
1300	Chimney or Stack
1400	Waste Handling
1500	Balance of Plant

TABLE 3

List of Major Plant Sections in PFBC Repowering

Section	Definition
100	Solids Receiving, Drying, Grinding, and Slurrying
200	PFBC Steam Generator
300	High-Temperature Particulate Removal
400	Gas Turbine(s)/Generator
500	Steam Turbine(s)/Generator
600	Electrical Power Plant (switchgear, transformers, controls, distribution panels)
700	Post Gas Turbine Heat Recovery
800	Post Gas Turbine Particulate Removal
900	Solid Waste Handling
1000	Balance of Plant (control and office buildings, machine shop, warehouse and garages, auxiliary boilers and diesel building, waste treatment structures, stack, hot gas piping, interconnecting duct work, fans, supports, foundations, fuel oil system, plant air system, fire protection, general plant equipment)

TABLE 4

List of Major Plant Sections in AFBC Repowering

Section	Definition
100	Solids Receiving, Drying, Grinding, and Slurrying
200	AFBC Steam Generator
300	Steam Turbine(s)/Generator
400	Electrical Power Plant (switchgear, transformers, controls, distribution panels)
500	Particulate Removal
600	Solid Waste Handling
700	Balance of Plant (control and office buildings, machine shop, warehouse and garages, auxiliary boilers and diesel building, waste treatment structures, stack, hot gas piping, interconnecting duct work, fans, supports, foundations, fuel oil system, plant air system, fire protection, general plant equipment)

TABLE 5

List of Major Plant Sections in IGCC Repowering

Section	Definition
100	Solids Receiving, Drying, Grinding, and Slurrying
200	Oxygen Plant/Air Compressor
300	Coal Gasification Including Pressurized Fuel System and Ash Removal
400	Gas Stream Heat Recovery
500	Gas Stream Particulate Removal
600	Gas Stream Desulfurization
700	Gas Turbine(s)/Generator
800	Steam Turbine(s)/Generator
900	Booster Compressor
1000	Wastewater Treatment
1100	Solid Waste Handling
1200	Balance of Plant (switchgear, transformers, controls, distribution panels, control and office buildings, machine shop, warehouse and garages, auxiliary boilers and diesel building, waste treatment structures, stack, hot gas piping, interconnecting duct work, fans, supports, foundations, fuel oil system, plant air system, fire protection, general plant mechanical and electrical equipment).

Worksheet 3: Description of Major Plant Sections in Block Flow Diagrams on Worksheet 2

On Worksheet 3, information is to be provided for each of the plant sections shown on Worksheet 2 which would be modified or added to the plant as part of the proposed clean coal technology. A separate copy of Worksheet 3 is to be used for each section. Where applicable, the following information is to be provided: (a) section name; (b) process description documenting the process chemistry and reaction conditions associated with major unit operations (e.g., flue gas treatment or PFBC) or the key mechanical operation parameters (e.g., physical coal cleaning) within the section; (c) key process design criteria such as reagent/consumable stoichiometries, process residence time data, and replacement equipment size (e.g., replacement burner capacity); (d) description of process sequence; and (e) existing equipment modifications required to implement the clean coal technology. (If this information is included in the main text of the proposal, a cross-reference to the information can be provided.)

In addition to the above-mentioned information, specific plant-section variable operating requirements must be included that provide quantity (on an hourly basis) and a description of consumed or generated mass and/or energy. The following categories of variable operating requirements must be considered: thermal; power; chemical/sorbents consumed; and by-products.

Worksheet 4A & 4B: Equipment Costs for Boiler Site Modifications

On Worksheets 4A and 4B, information on the costs for installing the clean coal technology equipment at the reference power plant is to be provided. The equipment costs developed on the worksheets exclude project contingencies, engineering and home office fees, allowance for funds used during construction (AFDC) and price escalation, startup and working capital, and initial catalyst and chemical costs. These costs are considered in Worksheet 5. Proposers of a coal processing technology must complete a Worksheet 4A for any capital costs incurred at the reference power plant to convert to use of the processed fuel. Methodology and assumptions used in developing the costs can be provided by the proposer as an addendum to Worksheet 4, if desired. Directions for filling in each of the columns on Worksheet 4A and 4B to calculate capital costs are given immediately below.

Worksheet 4A applies to retrofit technologies and Worksheet 4B applies to repowering technologies.

Column 1 -- For retrofit technologies, this column of Worksheet 4A is already filled out. For repowering technologies, plant section numbers are to be listed in Column 1 of Worksheet 4B; numbers should correspond to section numbers used in one of Tables 3 through 5, as applicable. Plant modification costs not included with any other plant section costs should be included as a separate line item.

Column 2 -- For retrofit technologies this column of Worksheet 4A is already filled out. For repowering technologies, plant section titles for Worksheet 4B should correspond to the titles used in one of Tables 3 through 5, as applicable.

Column 3 -- For retrofit technologies, the costs on Worksheet 4A shown in Column 3 should be for installation of the incremental equipment and any required modification or refurbishment of existing equipment in the reference power plant. Costs should be calculated as if the work was done in an entirely new, grass roots plant of the capacity shown in Worksheets 1A and 2. For repowering technologies, the costs on Worksheet 4B should be the total costs by section for building an entirely new plant of the capacity shown in Worksheets 1A and 2. (Note: the adjustments to the Column 3 values in Worksheet 4A or 4B to account for the use of existing equipment and retrofit difficulties in an existing plant are made using the factors provided in other columns as discussed below.) For each plant section, the costs given in Column 3 should include both direct field material and labor costs, as well as the civil engineering, structural, and architectural costs associated with the plant section. Since it is to be assumed this data is applicable to the Nth plant, any economies due to factors such as design standardization, modularization, etc. should be utilized in estimating these costs. Vendor price quotes, cost data from previous design studies of a similar size and scope, or existing literature data can be used to establish the installed cost of each plant section.

The cost reporting basis for the worksheets is 1988 dollars. All costs should be adjusted to 1988 dollars using the appropriate process plant cost index factor obtained from Table 6 and the equation shown below.

$$\text{Cost data in 1988 base-year} = \text{Cost data in other year} \times \frac{342.4}{\text{Cost factor in other year}}$$

TABLE 6

Process Plant Cost Index Factors

Annual Index	Cost Factor	Annual Index	Cost Factor
1970	125.7	1979	238.7
1971	132.2	1980	261.2
1972	137.2	1981	297.0
1973	144.1	1982	314.0
1974	165.4	1983	316.9
1975	182.4	1984	322.7
1976	192.1	1985	325.3
1977	204.1	1986	318.4
1978	218.8	1987	323.8
		1988	342.4

Column 4 -- The development status of a technology affects the accuracy with which the cost of a commercial version of that technology can be estimated. In order to quantify uncertainty in the design and in project cost of commercial-scale equipment, a process contingency factor is applied to each major plant section. Table 7 provides guidelines for selecting process development contingency factors for each plant section based on the present level of development of the technology used within that section. Appropriate factors are to be listed in Column 4 of Worksheet 4A or 4B.

Column 5 -- Adjusted new plant installed equipment cost is entered in Column 5 by plant section. It is computed as the multiplicative product of unadjusted new plant installed equipment cost (Column 3) and process contingency factor (Column 4). Values in Column 5 should be summed and entered in the space provided.

TABLE 7

Technology Development Status

State of Technology	Process Contingency Factor*
New Concept with Limited Data	1.7
Bench-Scale Data Available	1.5
Small Pilot Plant Data Available	1.25
Full-Size Module Has Been Operated	1.15
Process is Used Commercially	1.00

* As a fraction of installed equipment cost.

Column 6 -- The equipment utilization factor appears only on Worksheet 4B and is applicable only to repowering technologies. It is a capital cost multiplier which only reflects the fraction (on a cost basis) of the plant section's equipment needs which must be satisified by new equipment. It will have values between 0.0 and 1.0. This factor is much less than 1.0 where a significant fraction of the existing equipment can be utilized (e.g., the steam turbine/generator section). This factor would equal zero if all of the modified plant sections equipment needs were satisfied by existing, installed equipment. Plant sections composed entirely of new equipment would have equipment utilization factors of 1.0.

TABLE 8

Retrofit Factors

Technology Class	Plant Size, MW 250	500
Add-On	1.55	1.45
Cold Duct	1.75	1.65
Hot Duct	1.95	1.85
In-Situ	2.15	2.05
Other Pre-Comb.	1.55	1.45
PFBC	1.55	1.45
IGCC	1.45	1.35
AFBC	1.35	1.25

Column 7 -- On Worksheet 4B, installed equipment cost that is not yet adusted for retrofit difficulty is entered by plant section in Column 7. It is the multiplicative product of adjusted new plant installed equipment cost (Column 5) and equipment utilization factor (Column 6). Values for all plant sections should be summed and entered in the space provided.

Retrofit Difficulty Factor -- On both Worksheets 4A and 4B space is provided for entering the retrofit difficulty factor for the entire new installation. The retrofit factor is a capital cost multiplier which only reflects the complexity of construction and refurbishment activities in an existing plant. The magnitude of the retrofit factor depends on the "degree of difficulty" of the in-plant work and typically falls in the range of 1.0 to 2.5. Data on retrofit factors for utility

construction have been compiled and organized according to type of technology, original plant size (MW), and age of plant. Values appropriate to the age and sizes of the base case plants shown in Figures 1-4 of the Attachment are given in Table 8. Proposers should select the appropriate retrofit factor for the technology listed that is most like that being proposed and enter it in the space provided.

Total Retrofit Installed Equipment Cost -- This cost is computed as follows. For Worksheet 4A, the total adjusted new plant installed equipment cost (summation of entries in Column 5) is multiplied times the retrofit difficulty factor (RDF). For Worksheet 4B, the total unadjusted installed equipment cost (summation of entries in Column 7) is multiplied by the RDF. In either case the product is entered in the space provided.

Worksheet 4C: Costs for a Remote Coal Processing Plant

Proposers of a coal processing technology are to complete this Worksheet to describe costs of a greenfield, 750 ton per hour plant. Capital costs are to be entered by plant section in item 1.

Installed equipment costs are for greenfield installation. See the instructions for Worksheets 4A and 4B for a discussion of process contingency factor.

See the instructions for Worksheet 5 for completing items 3 - 10. Parts 3,4,5,7,8, and 9 are to be based on the proposer's judgment, and narrative support for the entries is expected. Any by-product credits claimed should be included in part 10 with an explanation.

Proposers of high-rank coal processing should not include coal feed as a variable cost. DOE will compute a processing cost for the proposed technology and add it to the cost of delivered coal at the power plant sites in its data base.

Proposers of low-rank coal processing should include the minemouth F.O.B. cost of the coal used in their process as a variable cost. DOE will compute the transportation charge for the new fuel form produced at the coal processing plant to each boiler site in its data base. Proposers of low-rank coal processing technologies must also provide discussion and data on transportation of their fuel product. The purpose is to help DOE compute transportation charges from the coal

processing plant, assumed to be located near the feed coal source, to utility power stations throughout the U.S. The mode of transportation should be stated. Anticipated shipping costs to several major cities located throughout the country should be given, or some alternative manner of furnishing similar data should be used. The basis of the shipping cost estimates should be given. If this information is presented elsewhere in the proposal, reference may be made to this information.

WORKSHEET 5: Financial Requirement Calculation

This Worksheet develops the incremental or total capital requirement respectively for retrofitted or repowered commercial power plants, using a technique which parallels an EPRI format[2]. In addition, operating and maintenance requirements for the proposed facility are calculated.

Total (or incremental) capital cost, as computed by this Worksheet, includes the total installed equipment cost, general facilities, project contingency, engineering and home office fee, AFDC and price escalation, royalty allowance, preproduction costs, inventory capital, and initial catalyst and chemicals. Appropriate factors for allowance for funds for interest and price escalation during construction are provided in Table 9.

Process area capital cost, item A, is obtained from the final entry on worksheet 4A or 4B, total retrofit installed equipment cost. For retrofit technologies, if any additional costs are incurred as a result of work done in plant sections not listed on Worksheet 4A, a plant work scope adjustment charge should be included for the entry in item A.

[2] EPRI Technical Assessment Guidelines, EPRI P-4463-SR, Volume 1, 1986.

TABLE 9

ALLOWANCE FOR FUNDS FOR INTEREST AND PRICE ESCALATION DURING CONSTRUCTION

Construction Period (Years)	AF (Fraction of Total Plant Cost)
1	0
2	0.030
3	0.062
4	0.096
5	0.130
6	0.167

The Total Plant Cost, item B, consists of process area capital, general facilities, project contingency, and engineering and home office fees. The Total Plant Cost can be estimated from the following expression:

Total Plant Cost = 1.42 * (Process Area Capital)

AFDC, item C, is computed by multiplying the appropriate factor from Table 9 times the Total Plant Cost.

The Total Plant Investment, item D, is the sum of the Total Plant Cost and AFDC.

Items E through H consider other costs associated with start-up of the modified power plant (royalty allowance, preproduction costs, inventory capital, and initial catalyst and chemicals). Royalty allowance is to be estimated as 0.5 % of the process area capital unless the proposed technology would not anticipate having any royalty charge for commercial applications. Preproduction costs reflect operator training, equipment checkout, plant repair and modifications during start-up, and inefficient use of fuel and other materials during plant start-up. This cost is estimated as the sum of the following items: one month fixed O&M cost; one month variable operating cost excluding fuel and by-product credits; twenty-five percent of full-capacity fuel cost for one month; and two percent of the total plant investment. Inventory capital reflects the inventory required for fuel and other consumables needed to start-up the modified power plant. This cost is estimated as

60 days variable operating cost, excluding by-product credits. The initial cost of catalyst and chemicals contained in the process equipment at start-up is to be included in the initial catalyst and chemical cost.

The Total Capital Cost is computed as the sum of items D,E,F,G, and H.

The second part of Worksheet 5, operating and maintenance requirements, considers both fixed and variable costs. By convention, only consumed and produced commodities appear in the variable cost. Quantity and type of commodities consumed and produced in the modified power plant are to be extracted from information given in Worksheet 3.

Variable costs include sorbents/chemicals, water, steam, auxiliary power, and waste disposal. Table 10 provides DOE's operating unit cost values to be used in calculation of Item J (Variable Operating Cost). The proposer may derive alternative estimates of variable costs if justified. Such alternative costs must be documented with supporting material. Proposers may take credit for by-products as indicated in Table 10. Any credit taken must be explained.

Cost of coal should not normally be included as a variable cost for repowering technologies. DOE will compute this cost. The cost of any supplementary fuel such as gas, oil, or special coal (e.g., of low sulfur content) used in either retrofitting or repowering must be included, however. For instance, certain retrofit technologies use supplementary fuels for sorbent regeneration or reburning. When a supplementary fuel is used, explanation must be included as to how its use affects the feed rate of the coal that constitutes the major fuel to the boiler.

By convention, all operating and maintenance labor and materials appear in the fixed O&M category. Total annual maintenance cost, item K, is estimated as a percentage of the replacement cost of the individual sections in the plant. The annual maintenance cost for each plant section, which includes labor and materials, is to be estimated by the following expression.

Plant Section Annual Maintenance Cost = (Maintenance Factor) *
(New Plant Installed Equipment Cost)

The total annual maintenance cost is obtained by summing all annual maintenance costs for each plant section. Recommended maintenance factors, based on the type of processing conditions within a given section, are given in Table 11. New plant installed equipment costs by plant section are found in column 5 of Worksheet 4A or 4B.

The total annual fixed O&M cost, item M, is considered to be a function of the annual maintenance cost and the operating labor cost. Annual operating labor cost (MM$) is based on the number of operators per shift. The number of operators per shift is to be entered in item L. The total annual operator hours is the product of the number of operators/shift and the number of hours per year (8760). The annual operating labor cost is the product of the operator hours and the operating labor payrate per hour. The annual operating cost must be converted to MM$. The operating labor payrate is given in Table 10. Use the following expression:

$$\text{Operating Labor Cost, MM\$} = (\text{number op./shift}) * (8760) * (\text{labor payrate,\$/hr}) * 10^{-6}$$

The calculated annual operating labor cost is to be entered in item L.

The total annual fixed O&M cost is then calculated from the following expression:

$$\text{Total Annual Fixed O\&M} = 1.12 * (\text{Annual Maintenance Cost}) + 1.3 * (\text{Operating Labor Cost})$$

The calculations are based on a 40% labor / 60% materials maintenance cost ratio and an annual administrative and support labor requirement that is 30 % of the sum of the maintenance and labor costs.

TABLE 10
OPERATING COST VALUES[1]
(1988 $)

Item	Value/Units
OPERATING LABOR PAY RATE	$21.92/HR
Commodities: All costs delivered to plant sites except as noted	
FUELS	
FUEL OIL (NO. 2)	$0.60/GAL
FUEL OIL (NO. 6)	$0.48/GAL
METHANE	$3.00/1000 FT^3
ANTHRACITE (HHV=15,135 BTU/LB)	$83.00/TON
BITUMINOUS COAL (UP TO 1% SULFUR, HHV=12,415 BTU/LB)	$46.10/TON
BITUMINOUS COAL (1.0 TO 2.0 % S, HHV=12,369 BTU/LB)	$40.85/TON
BITUMINOUS COAL (MORE THAN 2% S, HHV=11,619 BTU/LB)	$36.19/TON
SUBBITUMINOUS COAL (0.4% S, HHV=8,909 BTU/LB)	$18.20/TON F.O.B. MINEMOUTH
LIGNITE (0.8% S, HHV=6,377 BTU/LB)	$11.26/TON F.O.B. MINEMOUTH
WATER/STEAM	
CONDENSATE	$0.75/1000 LB
RAW WATER	$0.65/1000 GAL
COOLING WATER	$0.16/1000 GAL
STEAM	
	LOW PRESSURE (0 - 70 psia) $3.05/1000 LB
	MEDIUM PRESSURE (70 - 250 psia) $3.75/1000 LB
	HIGH PRESSURE (250 - 2400 psia) $5.70/1000 LB
POWER	
PARASITIC POWER	$0.05/KWHR
INCREMENTAL REPLACEMENT POWER COST	$0.035/KWHR
SORBENTS/CHEMICALS	
CATALYST (COPPER OXIDE)	$3250.00/TON
AMMONIA	$145.00/TON
LIME	$70.00/TON
LIME (HYDRATED)	$75.00/TON
LIMESTONE	$16.70/TON
NAHCOLITE	$40.60/TON
EDTA	$740.00/TON
TRONA	$130.00/TON

LIQUID OXYGEN	$117.00/TON
ALLIED CATALYST	$2000.00/TON
CLAUS CATALYST	$660.00/TON
PHOSPHORIC ACID	$600.00/TON
SELEXOL ABSORBENT	$11.80/GAL
DIATOMACEOUS EARTH	$320.00/TON
LAND	$7000.00/ACRE

WASTE DISPOSAL CHARGES

FABRIC FILTER BAGS	$92.60/BAG
DISPOSAL CHARGES	
DRY SOLIDS (TRUCKED-LANDFILL)	$8.60/TON
FLY ASH (TRUCKED-LANDFILL)	$7.00/TON
GYPSUM (TRUCKED-LANDFILL)	$7.00/TON
SLUDGE	$10.00/TON

BY-PRODUCT CREDIT

SULFUR	$118.00/LONG TON
FERTILIZER	$113.00/TON
SULFURIC ACID	$86.00/TON
METHANOL	$0.60/GAL
AMMONIA	$145.00/TON

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[1] Any commodity may be sold for 80% of its "cost value"

TABLE 11
Maintenance Data

Type of Processing Conditions Within Plant Section	Annual Maintenance Factor*
Corrosive and Abrasive Slurries	0.06
Solids at High Pressure and/or High Temperature	0.04
Solids at Low Pressure and/or Low Temperature	0.04
Liquids and Gases	0.02
Utilities	0.01

* As a fraction of installed cost.

Worksheet 6: Cost and Performance Variations with Plant Size and Operating Variables

Data on fixed and operating costs and on process performance of the proposed technology as applied to the appropriate reference plant have been provided in the foregoing Worksheets. The proposer is now instructed to prepare a Worksheet 6 to provide information on how costs and performance vary with plant size and operating variables.

The variables and their ranges of interest to DOE for conducting the present analysis are shown in Table 12. Not all variables are relevant to all classes of proposed technologies. For instance, variations with plant size are not needed for coal processing technologies. Variations with pyritic sulfur fraction are not important for many technologies.

TABLE 12

Plant Size and Operating Variables

Variable	Range of Interest
Plant Size (boiler site)	Utilities: 100-800 MWe nameplate capacity Non-utilities: range of recommended service
Coal Sulfur Content	1-4 percent sulfur
Fraction of total sulfur present as pyrite	0.4-0.8

The cost and performance parameters of interest to DOE are shown in Table 13. At least four of the five entries in the table are relevant to every proposed technology, and for technologies removing both SO_2 and NO_x all five entries are relevant.

TABLE 13

Cost and Performance Parameters

- Capital Cost, $/MWe nameplate capacity
- Fixed O&M cost, mill/kWh
- Variable Operating Cost, mill/kWh
- NO_x Reduction, percent
- SO_2 Reduction, percent

DOE has information on scaling relationships for many clean coal technologies with respect to cost and performance for the variables in Table 12. DOE is prepared to use its information to satisfy its need for the present analysis. DOE invites the proposer, however, to provide information on the variation of the cost and performance of the particular proposed technology. DOE is interested in information on each relevant item in Table 13 as a function of each relevant item in Table 12. The proposer is free to provide as much or as little information as it wishes in whatever form it wishes. The minimal acceptable submission is a sheet labeled Worksheet 6 on which the proposer states it is providing no information on cost/performance variation with plant size and operating variables. In this case DOE will perform the necessary calculations entirely with its own data.

ATTACHMENT A OF APPENDIX I

REFERENCE POWER PLANTS, REFERENCE COAL, AND WORKSHEET INSTRUCTIONS

This Attachment describes a 500 MWe reference power plant and an alternative 250 MWe reference plant. It provides an analysis of the reference coal in Table 2. It provides information about the reference coal of use to proposers of physical beneficiation processes in Tables 7-9. Table 7 provides size and chemical analyses, Table 8 provides detailed washability analyses for coal crushed to 1 1/2 inch top size, and Table 9 provides detailed washability analyses for coal crushed to 3/8 inch top size.

A.1 General Description of Reference Power Plant

The reference power plant is an existing plant which is to serve as the basis for generating a base case for the proposed clean coal technology. The reference power plant is a subcritical, pulverized coal-fired plant that is nominally 500 [250] MWe (net) in size, with no provision for SO_2 and NO_x emission control. The reference plant design[s] described in this document is based on modifications of a conceptual design presented in a report by Argonne National Laboratory*.

In this reference plant, space was allotted for contingency coal handling equipment and is shown in dotted outline on Figures 2, 3, and 4. In utilizing this reference plant configuration, this space is available for other uses if not needed for coal handling equipment.

The reference plant is located in the East Central Region of the continental United States. Site conditions are given in Table 1. The power plant is 30 years old and in average condition for its age. It is intended that the proposed retrofit or repowering be a part of a general plan to extend the plant's expected operational lifetime to 60 years.

TABLE 1

Site Conditions for Reference Plant

600 Feet Elevation	Dry Bulb Design Temperature, 60°F
Seismic Zone 1	Wet Bulb Design Temperature, 52°F
Pile Foundations as Required	Maximum Dry Bulb Temperature, 95°F
River Water Supply	Maximum Wet Bulb Temperature, 75°F
Rail Access	Minimum Temperature, -10°F
14.4 psia, Ambient Design Pressure	

Coal is delivered by unit train. Provision for a 60-day dead coal storage area is included on site. Live storage retrieval and conveyors deliver 500 [250] tons per hour (tph) of coal to two 500 [250] tph crushers. The crushed coal is conveyed to the distribution bins. At design conditions, the reference unit consumes 196 [98] tph of coal; the analysis of the reference coal (a simulated Upper Freeport coal, Armstrong County, Pennsylvania) is presented in Table 2.

* "Design of Advanced Fossil Fuel Systems: A Study of Three Developing Technologies for Coal-Fired, Base-Load Electric Power Generation, Pulverized, Coal-Fired Power Plant with a Wet Limestone Flue Gas Desulfurization System." Prepared by Bechtel Group, Inc., For Argonne National Laboratory, Report Number ANL/FE-83-10.

TABLE 2

Reference Coal Analysis

Proximate Analysis (AR Basis), % wt	
Volatile Matter	30.6
Fixed Carbon	50.0
Ash	16.4
Moisture	3.0
	100.0

Ultimate Analysis (AR Basis), % wt	
Moisture	3.0
Carbon	67.5
Hydrogen	4.6
Nitrogen	1.2
Chlorine	0.1
Sulfur	2.5
Oxygen	4.7
Ash	16.4
	100.0

Sulfur Forms, % wt	
Pyritic	1.5
Organic	0.9
Sulfate	0.1
	2.5

Ash Fusion, °F	
Initial Deformation	2,200
Softening (H = W)	2,275
Fluid	2,400

Other Parameters	
Gross Heating Value, Btu/lb (AR Basis)	12,360
Grindability, Hardgrove	58.0
Total Sulfur, % wt	2.50
Free Swelling Index	7.5

The turbine throttle steam conditions are nominally 2,400 psig and 1,000°F, with 1,000°F reheat. The maximum rated capacity of the power plant could be approximately 10 percent higher than rated with the turbine throttle valves wide open and 5 percent over-pressure, if selected balance of plant equipment items were sized to accommodate this operating condition. A plot plan of the approximately 400 [300]-acre site is presented in Figure 1.

A.1.1 Power Plant Equipment

Arrangement drawings, Figures 2, 3, and 4, show the major equipment location within modules in the reference plant. Table 3 provides data on the mechanical equipment in the plant. The following descriptions provide additional detail for major plant modules.

The turbine-generator module is in good condition and does not need refurbishment. It is located in a fully enclosed 100 [80] by 200 [160]-foot structure containing the turbine generator and its related equipment. An auxiliary bay runs the length of the building. A bay at the front end of the turbine generator accommodates main steam and reheat piping. A bay at the generator end permits generator rotor removal. The turbine building is approximately 100 feet high.

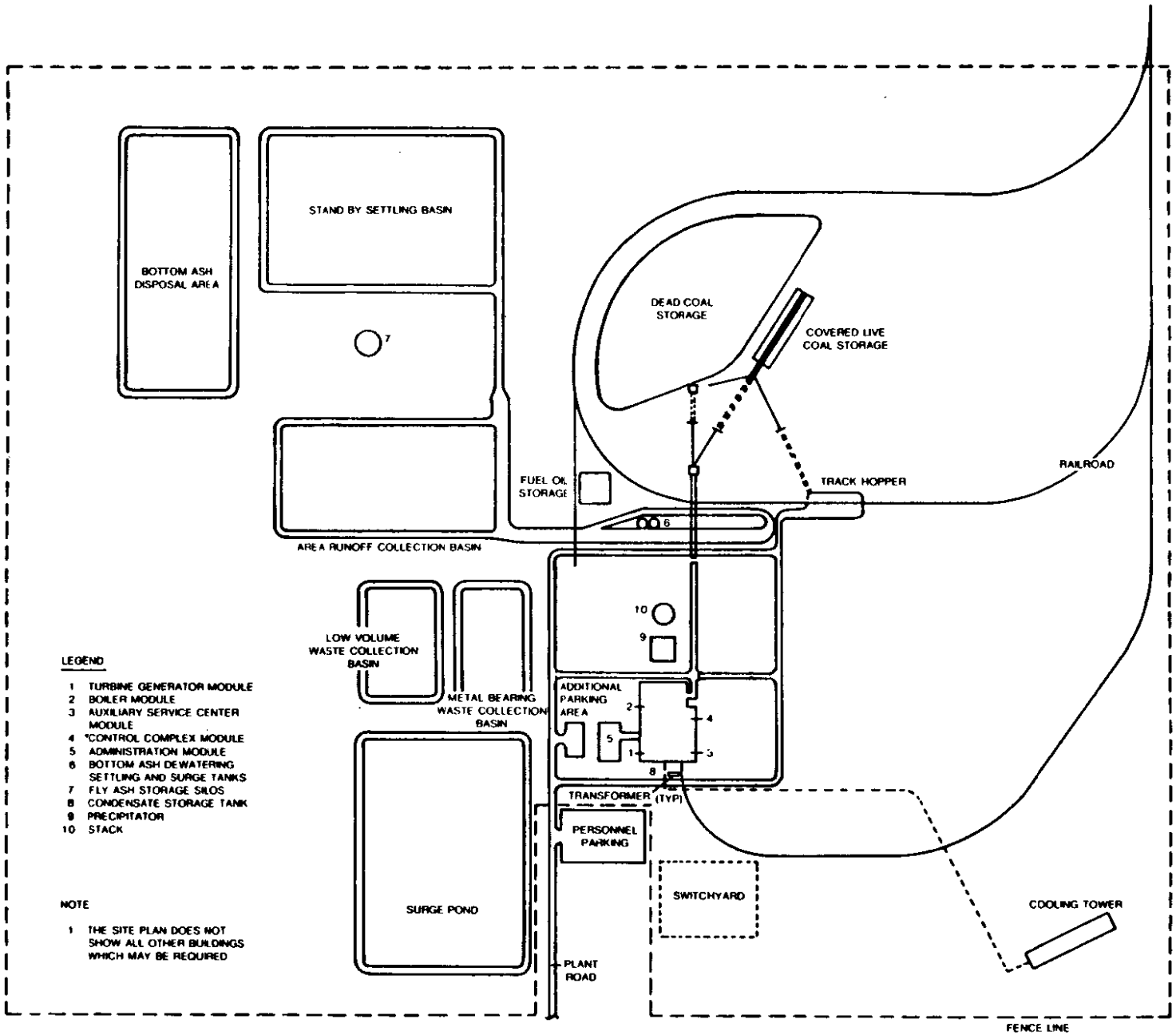


Figure 1. Reference Plant Site Plan

I88-392-A TS2

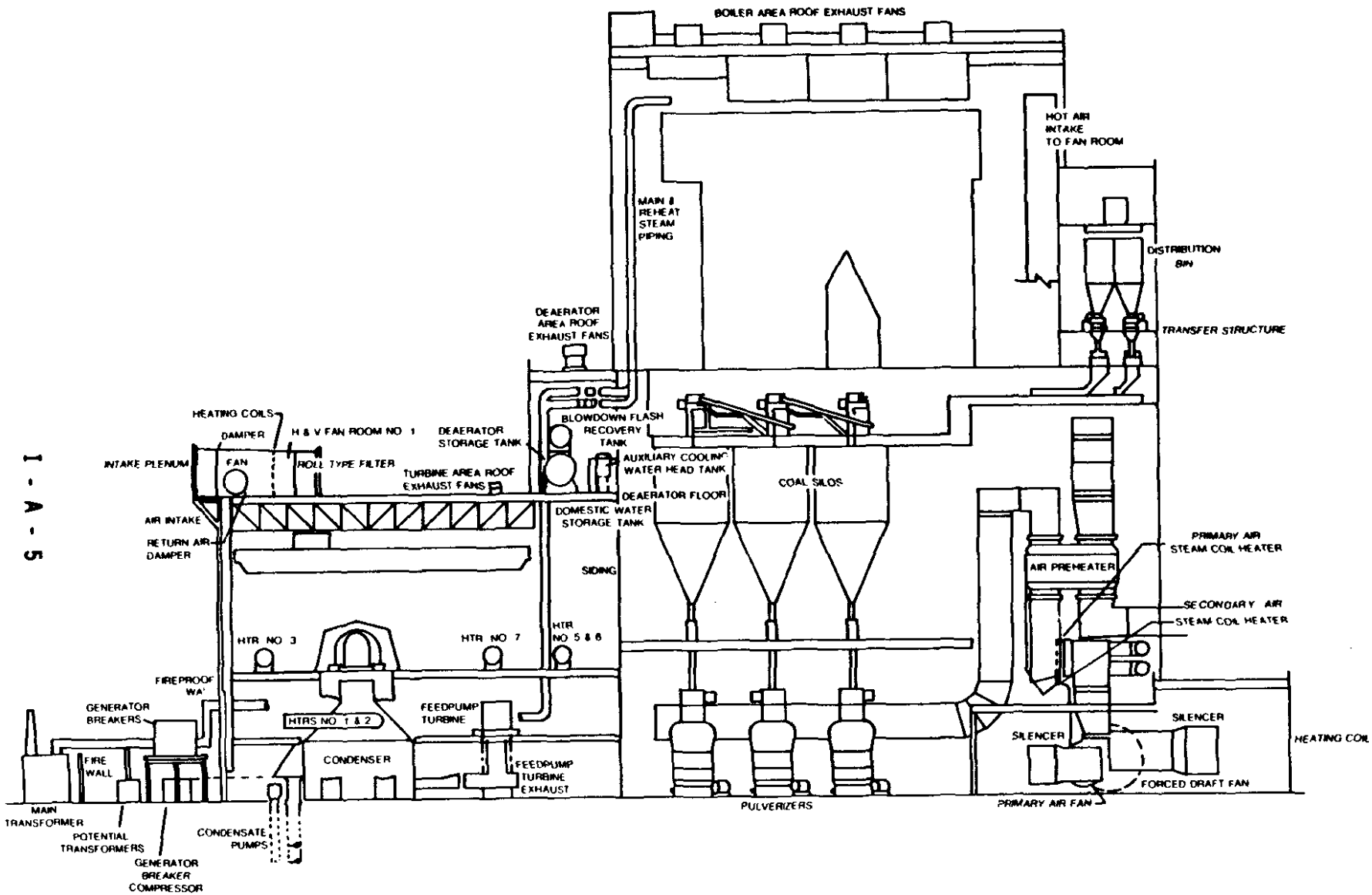


Figure 2. 500 MWe Reference Plant Arrangement Elevation

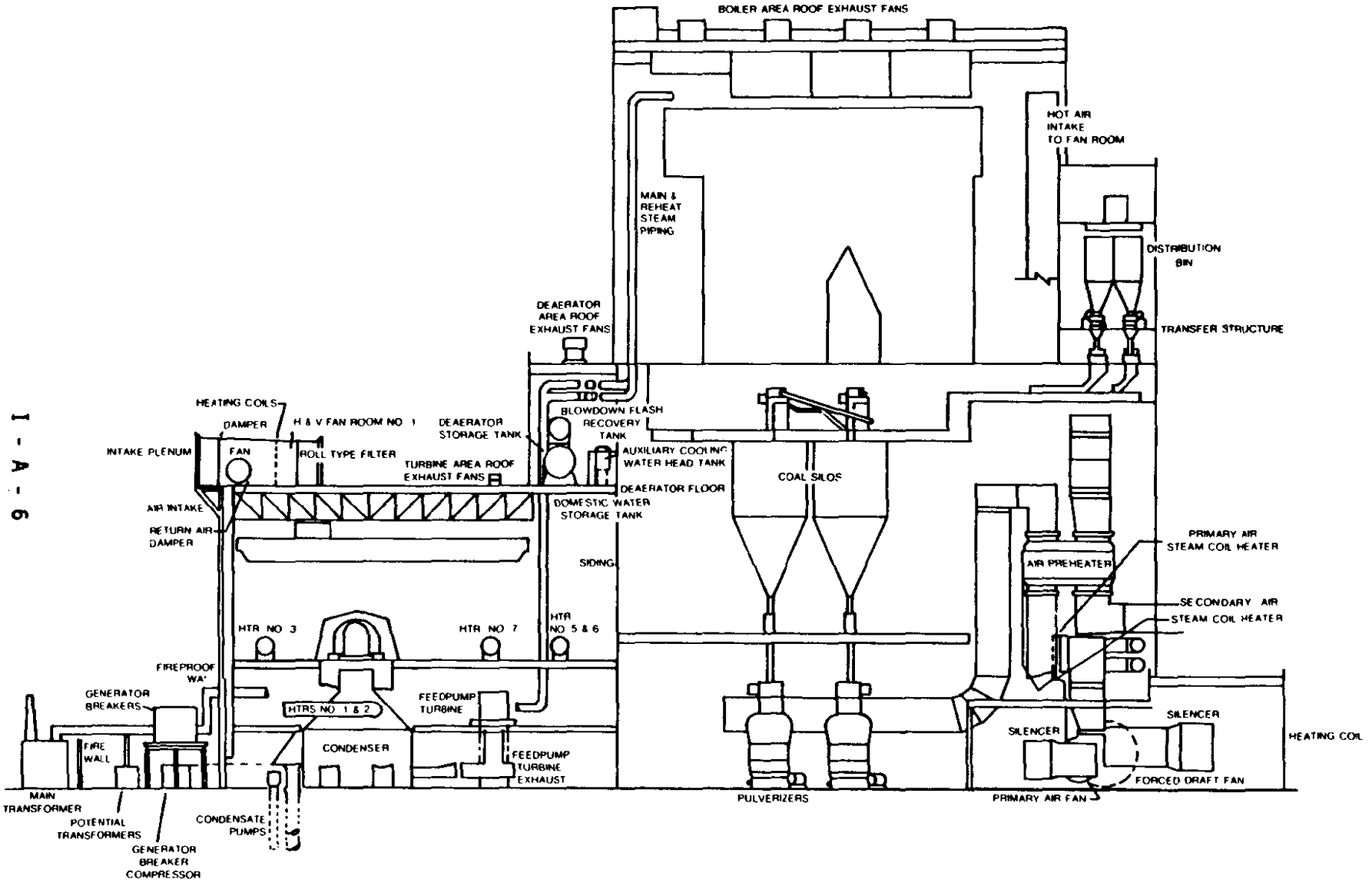


Figure 2a. 250 MWe Reference Plant Arrangement Elevation

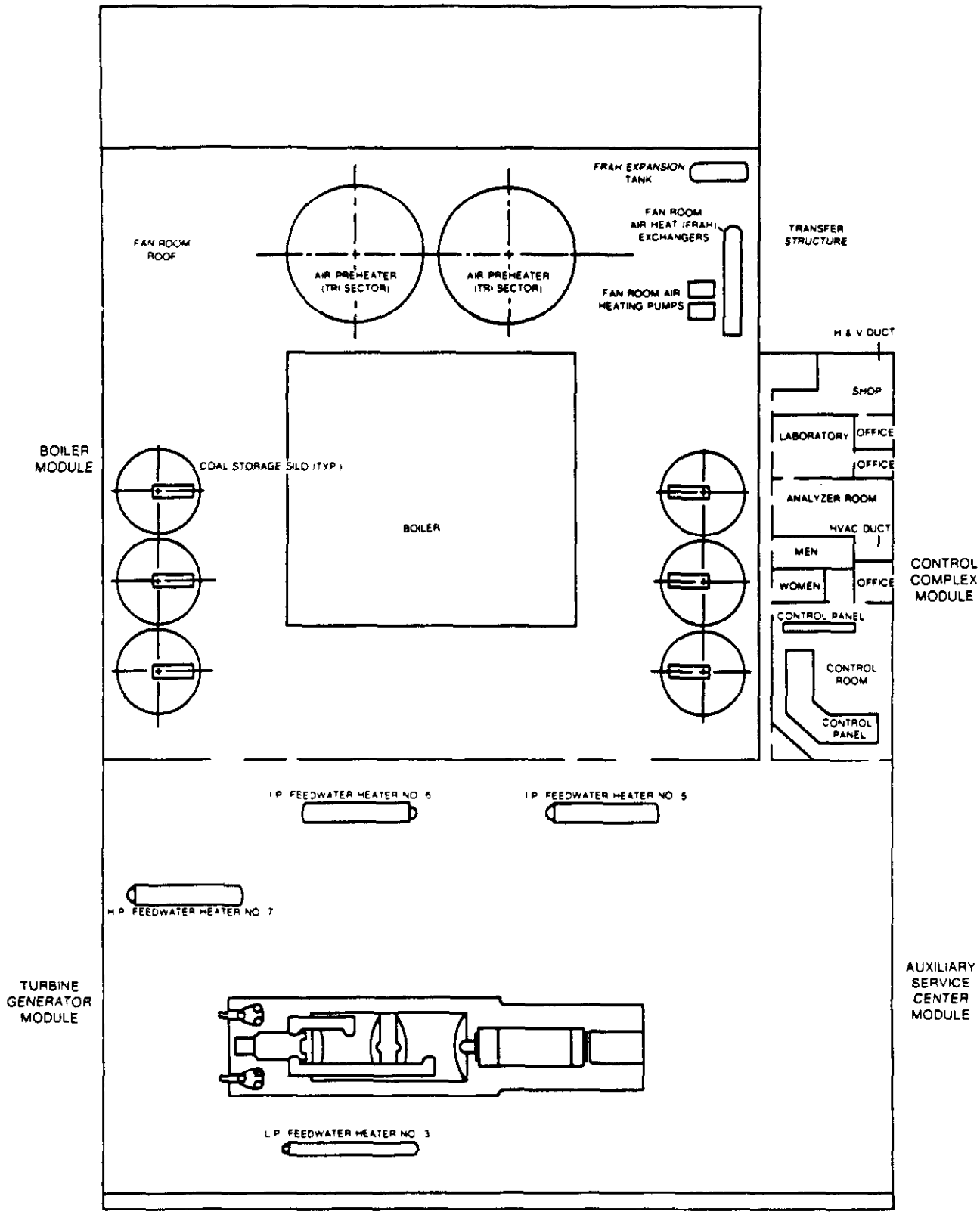


Figure 3. 500 MWe Reference Plant Arrangement Plan Operating and Feeder Floor

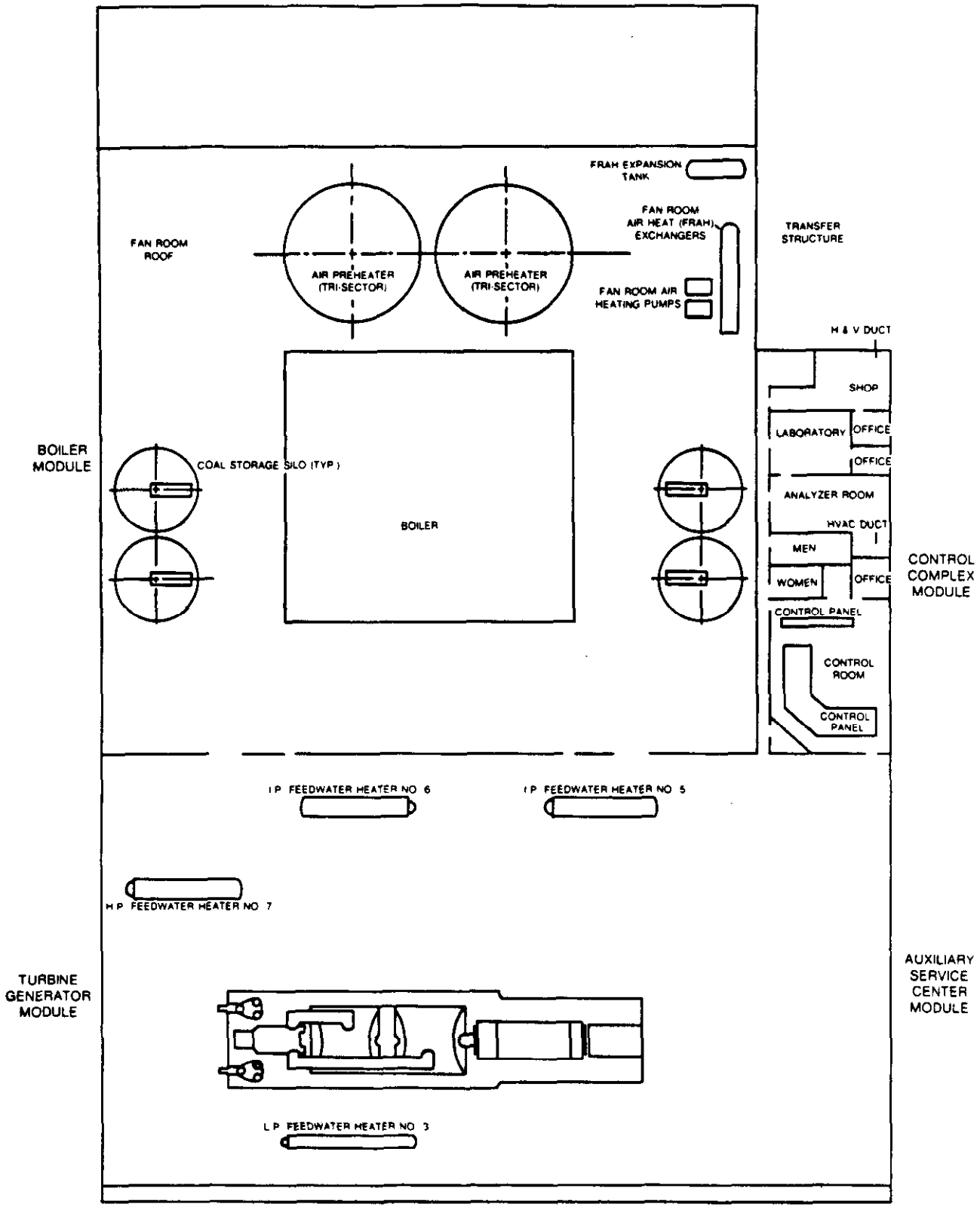


Figure 3a. 250 MWe Reference Plant Arrangement Plan Operating and Feeder Floor

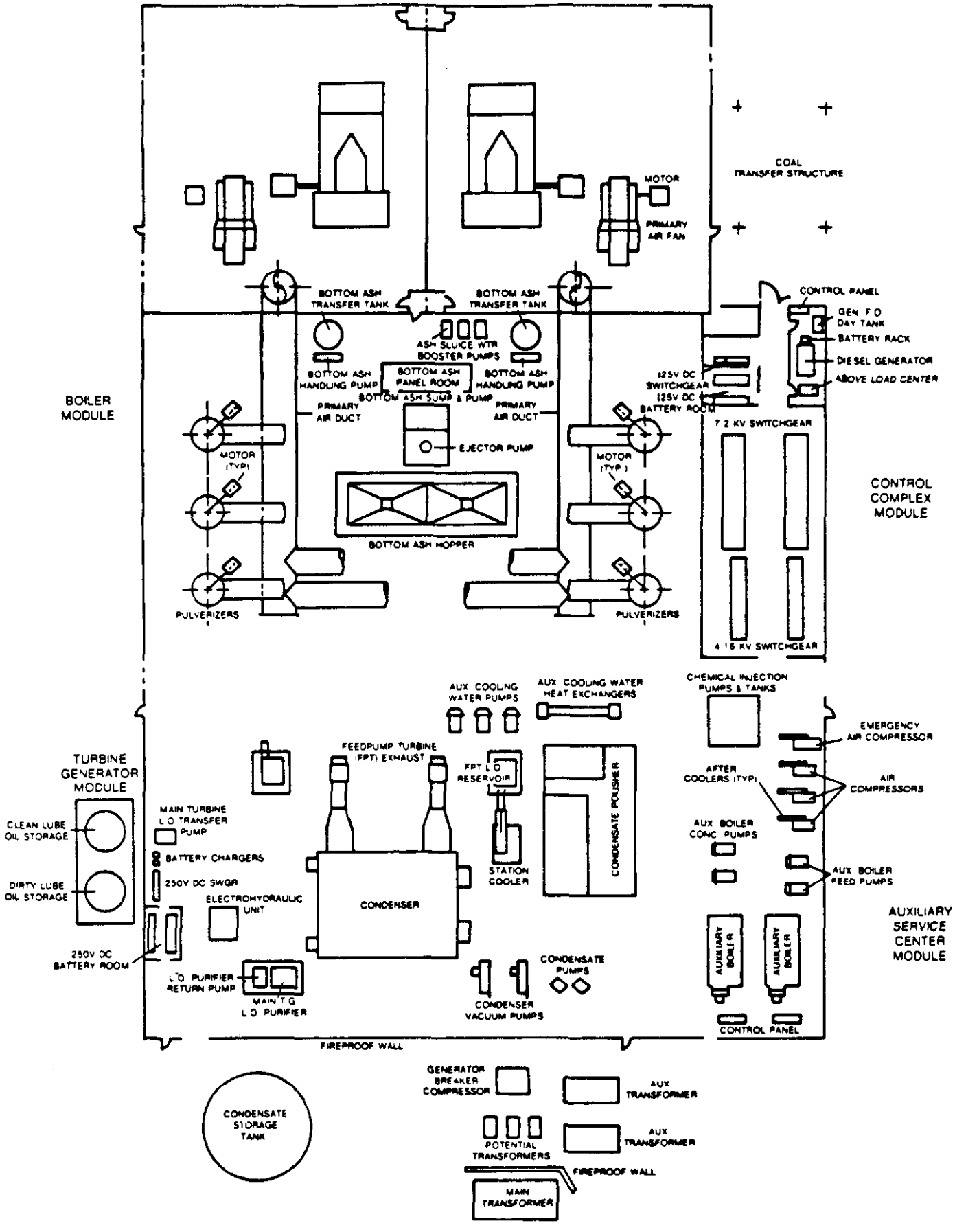


Figure 4. 500 MWe Reference Plant Arrangement Plan Ground Floor

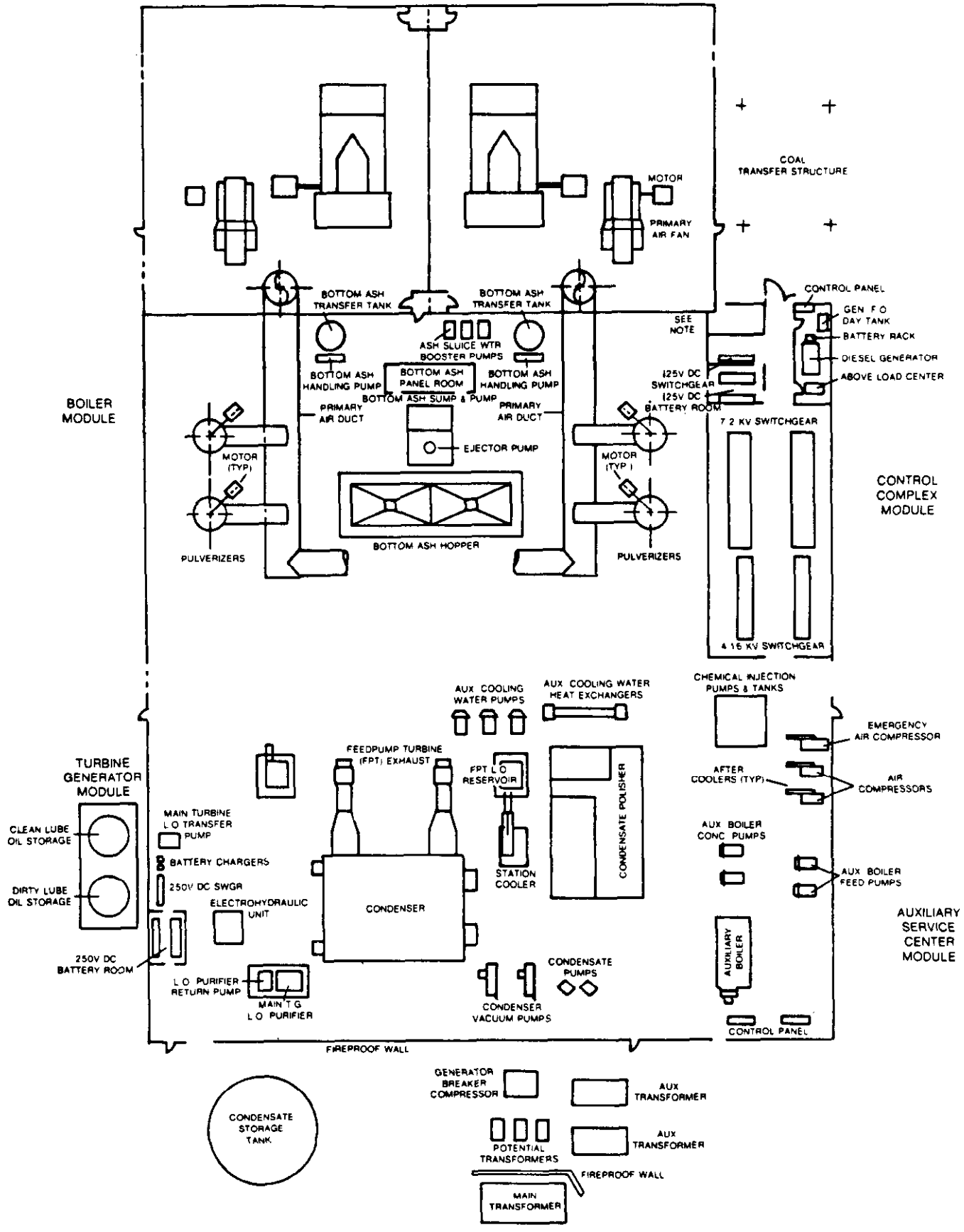


Figure 4a. 250 MWe Reference Plant Arrangement Plan Ground Floor

TABLE 3
Reference Plant Mechanical Equipment Data
500 MWe Reference Plant

Steam Generator	
Type	Balanced draft, direct fired, pulverized coal.
Main steam - (10^3 lb/hr)	3,625
- (psig/°F)	2,520/1,005
Reheat - (10^3 lb/hr)	3,336
- (°F)	1,005
Turbine Generator	
Frame size,last stage blade	30"
Generator rating - (MVA/PF)	640/0.85
Exhaust	2.0" HgA
Rated Capacity, Net/Gross(MW)	510/536
Auxiliary Boiler	
No./type/fuel	2/package/ No. 2 oil
Design rating - (10^3 lb/hr)	100
- (psig/°F)	150/500
Fans	
Forced draft - (No./driver)	2/motor
Primary air - (No./driver)	2/motor
Induced draft - (No./driver)	4/motor
Coal-Handling Facilities	
Type	Rotary dump
Unloading rate -(No.Belts/ tph)	1/3,000
Reclaiming rate - (No. belts/tph)	5/250
Ash-Handling Facilities	
Bottom ash unloading - tph	8
Storage	Dewatering pond
Fly ash unloading - tph	31
Storage	Silo

Condenser	
Shells	2
Surface - (Ft^2)	235,000
Feedwater Heaters	
Number of stages	7 stages, 6 closed, 1 open
Boiler Feedwater Pumps	
Number/driver	2/turbine
Total HP - (both)	17,455
Flow ea - (GPM/%)	5,000/50
Circulating Water	
Total flow - (GPM)	184,000
Cooling source	Cooling Towers
Ambient temp./degree rise - (°F)	60/30
No. pumps/HP	2/2,500
Precipitator	
Type:	Electrostatic
Emissions (lb/MM Btu)	0.10
Specific Collector Area-(Ft^2/1000 ASCFM)	200
Main Power Transformers	
Number/type (ea/No. phases)	4/1 (1-spare)
MVA/Temp Rise	640/65°F
Voltage - kV/kV	24/345
Switchyard	
Breakers - No.	6
Size - kV	345

TABLE 3A
Reference Plant Mechanical Equipment Data
250 MWe Reference Plant

Steam Generator	
Type	Balanced draft, direct fired, pulverized coal.
Main steam - (10^3 lb/hr)	1,813
- (psig/°F)	2,520/1,005
Reheat - (10^3 lb/hr)	1,668
- (°F)	1,005
Turbine Generator	
Frame size,last stage blade	21"
Generator rating - (MVA/PF)	320/0.85
Exhaust	2.0" HgA
Rated Capacity, Net/Gross(MW)	255/268
Auxiliary Boiler	
No./type/fuel	1/package/ No. 2 oil
Design rating - (10^3 lb/hr)	100
- (psig/°F)	150/500
Fans	
Forced draft - (No./driver)	2/motor
Primary air - (No./driver)	2/motor
Induced draft - (No./driver)	2/motor
Coal-Handling Facilities	
Type	Rotary dump
Unloading rate -(No.Belts/ tph)	1/3,000
Reclaiming rate - (No. belts/tph)	3/200
Ash-Handling Facilities	
Bottom ash unloading - tph	4
Storage	Dewatering pond
Fly ash unloading - tph	16
Storage	Silo
Condenser	
Shells	2
Surface - (Ft^2)	117,500
Feedwater Heaters	
Number of stages	7 stages, 6 closed, 1 open
Boiler Feedwater Pumps	
Number/driver	2/turbine
Total HP - (both)	8,778
Flow ea - (GPM/%)	2,500/50
Circulating Water	
Total flow - (GPM)	92,000
Cooling source	Cooling Towers
Ambient temp./degree rise - (°F)	60/30
No. pumps/HP	2/1,250
Precipitator	
Type:	Electrostatic
Emissions (lb/MM Btu)	0.10
Specific Collector Area-(Ft^2/1000 ACFM)	200
Main Power Transformers	
Number/type (ea/No. phases)	4/1 (1-spare)
MVA/Temp Rise	320/65°F
Voltage - kV/kV	24/345
Switchyard	
Breakers - No.	6
Size - kV	345

Superheated steam for the turbine-generator is supplied by a drum-type, forced-circulation, balanced-draft, dry-bottom boiler designed for operation using pulverized coal with startup on light fuel oil. The enclosure of the boiler is designed with the water-cooled walls. The unit contains 24 [16] horizontally-opposed, wall-fired burners. Each burner's capacity is 200 [150] million Btu/hr. The plan area heat release rate (the amount of heat generated per square foot of boiler plan area at the upper fuel burner level) is 1.5 million Btu/hr.-ft^2. The upper furnace gas residence time is 0.8 seconds.

Ducts between the air heater and the electrostatic precipitator (ESP) are sized for a gas velocity of 3,600 fpm. Gas residence time in this ductwork and the ESP manifold is 1.5 seconds. The reference plant stack is 718 [500] feet in height and consists of a concrete chimney with an acid brick liner.

Bays on either side of the boiler contain coal silos, feeders, and pulverizers. The remaining space is reserved for the boiler, combustion air ducts, and coal pipes. Space at the back of the boiler is reserved for the boiler-to-air heater duct transition and for the air preheaters above the fan room containing the forced draft and primary air fans.

Six [Four], 50 [40] tph coal pulverizers are on the ground floor, three [two] on each side of the boiler. Gravimetric-type coal feeders are on the feeder floor above the coal pulverizers. The coal silos are above the coal feeders. Each silo feeds one pulverizer. The coal conveyors are above the silos. A gallery housing the surge bin and the feed conveyors is located behind the boiler above the ducts in the duct transition bay.

The bottom ash hopper is on the ground floor under the boiler. The pulverizer reject-storage tank and transfer tanks are also on the ground floor, underneath the heat recovery section of the boiler. The economizer ash collection tank is located directly under the economizer hoppers. Bottom ash handling pumps, ash sluice water booster pumps, and ash sump pumps are on the ground floor near the ash storage and transfer tanks.

The following equipment is located within the water treatment module: domestic water treatment system, makeup demineralizer, raw water pretreatment system, wastewater treatment plant, offices and laboratory, and sewage treatment system.

The electrostatic precipitator (ESP) module contains all of the equipment necessary to operate the cold, rigid frame ESP. Particulate emissions are controlled to 0.10 lb/MMBtu.

A.1.2 Plant Performance Assumptions

Overall performance parameters for the reference power plant are given in Table 4. The net plant heat rate includes an allowance of 6 percent for plant auxiliaries. The addition of a clean coal technology may result in a change in the net plant electrical output due to the consumption or production of power and steam. Similarly, the reference plant availability factor of 75% may change as a result of retrofit/repowering due to changes in both plant reliability and scheduled maintenance periods. The reference power plant boiler is uncontrolled with regard to SO_2 and NO_x emissions. It is assumed that 95 percent of the coal sulfur is converted to SO_2 resulting in emissions of 3.8 lb. SO2/MM Btu. Conventional, wall-fired burners are utilized with no combustion modifications for NO_x reduction. Total NO_x emissions (as NO_2) are 1.2 lb/MMBtu. A schematic of the flue gas flow through the boiler at full load design conditions is shown in Figure 5. Ash flow

rates are shown in Table 5. In Table 6, flue gas compositions are given at two different locations in the boiler ductwork. The molecular weight of the flue gas is 29.7.

TABLE 4

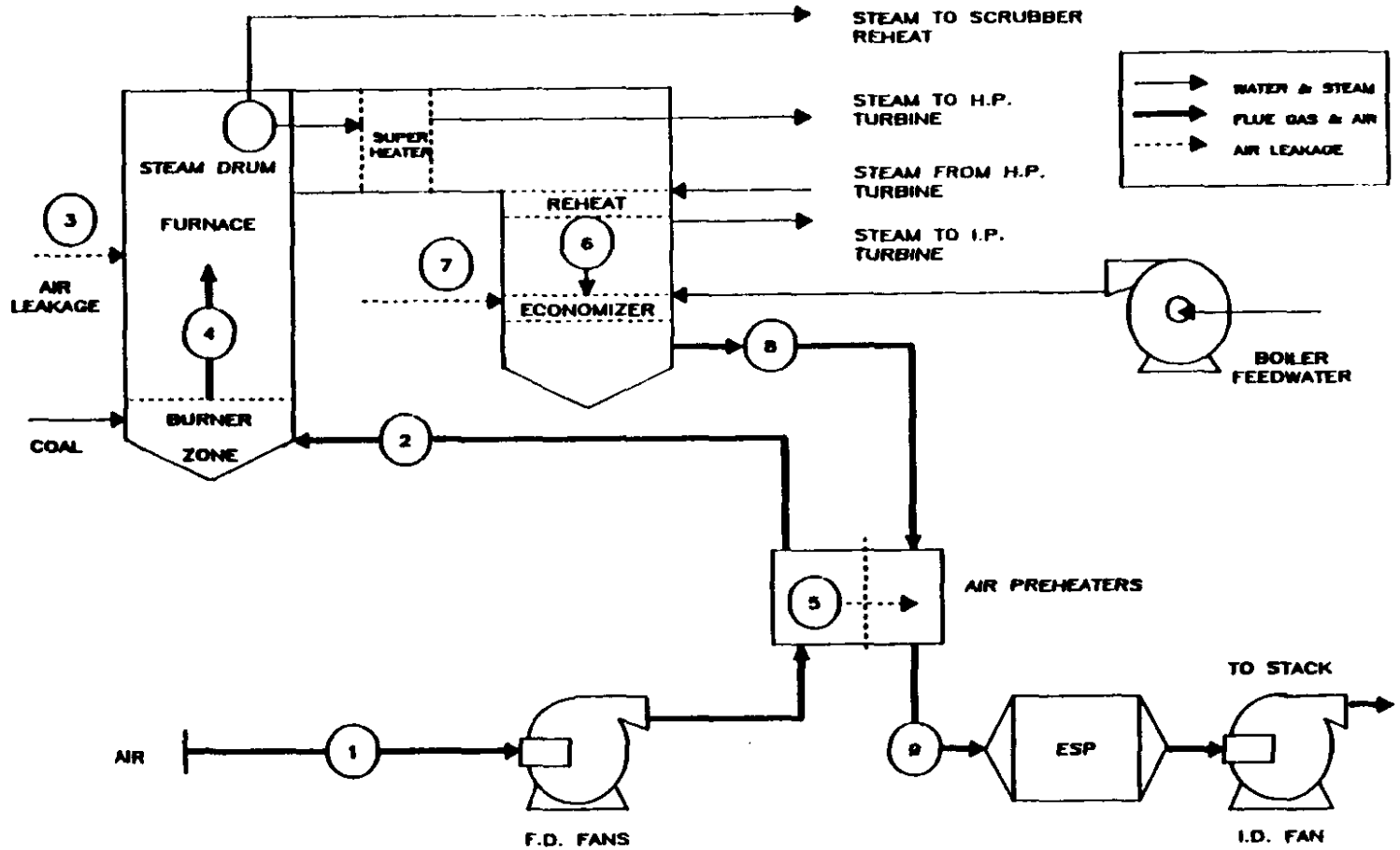
Reference Power Plant Performance Parameters

Steam Cycle Heat Rate, Btu/kWh	7,914 Btu/kWh
Boiler Efficiency, %	87.7%
Gross Heat Rate, Btu/kWh	9,024 Btu/kWh
Net Heat Rate, Btu/kWh	9,493 Btu/kWh
Coal Burn Rate, tph	196 [98]tph
Net Output, MWe	509.5 [254.8] MWe
Plant Availability Factor, %	75%

TABLE 5

Reference Power Plant Ash Flow Rates (Dry Basis)

	Tons Per Hour
Furnace Bottom Ash	6.3 [3.2]
Economizer Ash	2.4 [1.2]
Mill Rejects (Pyrites)	0.4 [0.2]
Fly Ash	22.9 [11.4]
Total	32.0 [16.0]



STREAM NO.	1	2	3	4	5	6	7	8	9
TEMP., °F	80	550	80	1600	80	1050	80	725	304
PRESSURE, in. WG	0.0	+0.6	0.0	−0.1	0.0	−5.0	0.0	−8.5	−11.8
MSCFM	998	917	19	975	81	995	15	1010	1091
MACFM	1036	1781	20	4242	84	2889	16	2302	1603
% OXYGEN; by volume	21	21	21	2.7	21	3.1	21	3.2	4.5
% EXCESS AIR	26	16	--	16	--	19	--	20	30
SOLIDS, klb/hr	--	--	--	51.4	--	51.4	--	46.3	46.3

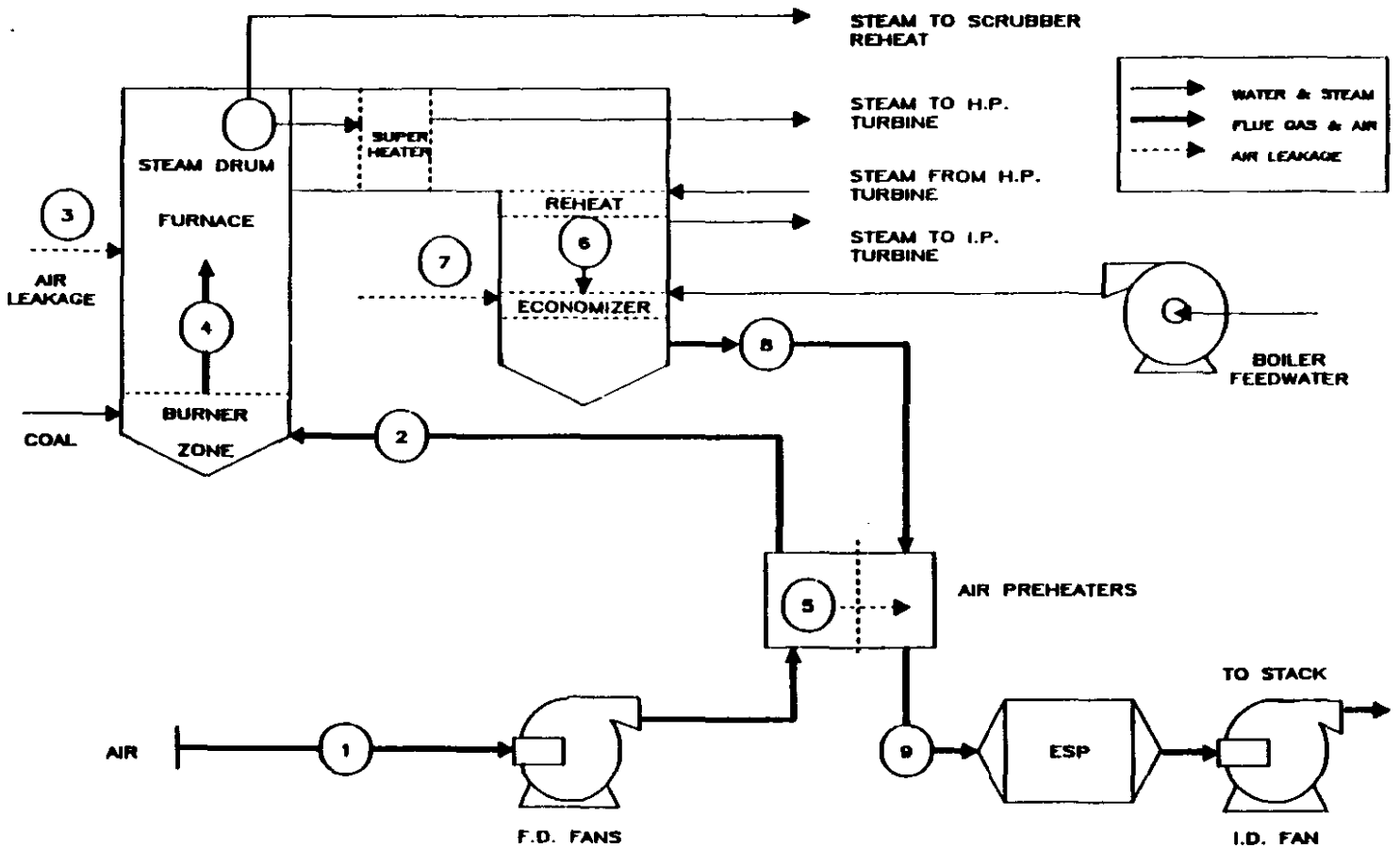
Standard Conditions

60 °F, 14.69 PSIA

Ambient Conditions

14.4 PSIA
60% R.H.
(0.013 lb H2O/lb Dry Air)

Figure 5. Schematic Flow Sheet of Nominal 500 MW Reference Plant



STREAM NO.	1	2	3	4	5	6	7	8	9
TEMP., °F	80	550	80	1800	80	1050	80	725	304
PRESSURE, in. WG	0.0	+0.6	0.0	−0.1	0.0	−5.0	0.0	−8.5	−11.5
MSCFM	499	459	10	488	41	498	7.5	505	546
MACFM	518	691	11	2121	42	1445	8	1151	802
% OXYGEN; by volume	21	21	21	2.7	21	3.1	21	3.2	4.5
% EXCESS AIR	26	16	--	16	--	19	--	20	30
SOLIDS, klb/hr	--	--	--	25.7	--	25.7	--	23.2	23.2

Standard Conditions

60 °F, 14.69 PSIA

Ambient Conditions

14.4 PSIA
60% R.H.
(0.013 lb H2O/lb Dry Air)

Figure 5a. Schematic Flow Sheet of Nominal 250 MW Reference Plant

TABLE 6
Reference Power Plant
Flue Gas Composition

	At Economizer Outlet		At Air Heater Outlet	
	% - Volume	lb/hr	% - Volume	lb/hr
O_2	3.2	166,000 [83,000]	4.5	250,200 [125,100]
CO_2	13.8	970,200 [485,100]	12.8	970,200 [485,100]
H_2O	8.0	230,600 [115,300]	7.6	235,300 [117,650]
N_2	74.7	3,339,900[1,669,950]	74.9	3,618,300[1,809,150]
	PPM	lb/hr	PPM	lb/hr
SO_2	1,803	18,400 [9,200]	1,669	18,400 [9,200]
SO_3	19	245 [123]	18	245 [123]
HCl	67	392 [196]	62	392 [196]
NO	752	3,600 [1,800]	696	3,600 [1,800]
NO_2	40	291 [146]	37	291 [146]
Total		4,729,660 [2,364,830]		5,096,980 [2,548,490]

TABLE 7
SIZE AND CHEMICAL ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO 1-1/2 INCH AND 3/8 INCH TOPSIZES

(INCH/MESH)	DIRECT ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	CUMULATIVE ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
					1 1/2 INCH X 0					
1 1/2 X 3/4	19.0	24.7	2.49	1.59	11135	19.0	24.7	2.49	1.59	11135
3/4 X 3/8	25.1	16.6	2.51	1.50	12459	44.1	20.1	2.50	1.54	11889
3/8 X 28	43.7	13.6	2.51	1.48	12981	87.8	16.9	2.51	1.51	12433
28 X 100	7.6	12.5	2.38	1.36	13194	95.4	16.5	2.50	1.50	12493
-100	4.6	14.2	2.49	1.95	12769	100.0	16.4	2.50	1.52	12506
					3/8 INCH X 0					
3/8 X 14	62.4	18.4	2.56	1.58	12265	62.4	18.4	2.56	1.58	12265
14 X 28	13.8	13.0	2.38	1.34	13148	76.2	17.4	2.53	1.54	12425
28 X 100	15.2	11.8	2.36	1.32	13360	91.4	16.5	2.50	1.50	12580
-100	8.6	14.1	2.34	1.85	12787	100.0	16.3	2.49	1.53	12598

TABLE 8
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 1 1/2 INCH TOP SIZE

SPECIFIC GRAVITY	DIRECT ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	CUMULATIVE ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
1-1/2 INCH X 3/4 INCH (19.9% OF 1-1/2 INCH X 100 MESH)										
FLOAT - 1.30	25.0	5.4	1.75	0.60	14376	25.0	5.4	1.75	0.60	14376
1.30 - 1.35	16.1	9.1	2.13	1.03	13693	41.1	6.8	1.90	0.77	14108
1.35 - 1.40	14.9	14.9	2.18	1.14	12644	56.0	9.0	1.97	0.87	13719
1.40 - 1.50	11.9	24.1	2.91	1.94	11032	67.9	11.6	2.14	1.06	13248
1.50 - 1.60	5.2	32.2	2.94	2.05	9666	73.1	13.1	2.19	1.13	12993
1.60 - 1.90	12.2	35.3	2.89	2.20	9157	85.3	16.3	2.29	1.28	12444
1.90 - 2.20	1.2	42.9	6.30	5.73	7939	86.5	16.6	2.35	1.34	12382
SINK - 2.20	13.5	76.0	3.39	3.15	3145	100.0	24.7	2.49	1.59	11135
3/4 INCH X 3/8 INCH (26.3% OF 1-1/2 INCH X 100 MESH)										
FLOAT - 1.30	37.9	4.5	1.67	0.52	14543	37.9	4.5	1.67	0.52	14543
1.30 - 1.35	22.2	9.4	1.95	0.85	13638	60.1	6.3	1.77	0.64	14209
1.35 - 1.40	13.4	14.6	2.61	1.57	12698	73.5	7.8	1.93	0.81	13933
1.40 - 1.50	9.1	23.6	3.47	2.50	11118	82.6	9.6	2.10	1.00	13623
1.50 - 1.60	2.9	30.4	4.10	3.21	9966	85.5	10.3	2.16	1.07	13499
1.60 - 1.90	6.4	36.9	3.95	3.26	8897	91.9	12.1	2.29	1.22	13179
1.90 - 2.20	1.3	40.0	6.63	6.06	8399	93.2	12.5	2.35	1.29	13112
SINK - 2.20	6.8	73.3	4.66	4.42	3505	100.0	16.6	2.51	1.50	12459

TABLE 8 (CONTINUED)
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 1 1/2 INCH TOP SIZE

SPECIFIC GRAVITY	DIRECT ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	CUMULATIVE ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
3/8 INCH X 28 MESH (45.8% of 1-1/2 INCH X 100 MESH)										
FLOAT - 1.30	51.9	4.3	1.47	0.32	14581	51.9	4.3	1.47	0.32	14581
1.30 - 1.35	18.4	9.3	1.80	0.70	13656	70.3	5.6	1.56	0.42	14339
1.35 - 1.40	9.2	13.8	2.49	1.45	12841	79.5	6.5	1.66	0.54	14166
1.40 - 1.50	6.3	21.8	3.65	2.68	11429	85.8	7.7	1.81	0.70	13965
1.50 - 1.60	2.6	28.9	4.58	3.69	10217	88.4	8.3	1.89	0.78	13854
1.60 - 1.90	4.3	38.3	6.30	5.61	8671	92.7	9.7	2.10	1.01	13614
1.90 - 2.20	1.3	39.9	7.78	7.21	8414	94.0	10.1	2.17	1.09	13542
SINK - 2.20	6.0	68.3	7.79	7.55	4186	100.0	13.6	2.51	1.48	12981
28 MESH X 100 MESH (8.0% of 1-1/2 INCH X 100 MESH)										
FLOAT - 1.30	57.4	3.0	1.44	0.29	14824	57.4	3.0	1.44	0.29	14824
1.30 - 1.35	13.8	7.7	1.60	0.50	13950	71.2	3.9	1.47	0.33	14655
1.35 - 1.40	6.8	13.2	2.09	1.05	12949	78.0	4.7	1.52	0.39	14506
1.40 - 1.50	5.1	21.1	3.20	2.23	11551	83.1	5.7	1.63	0.51	14325
1.50 - 1.60	3.2	24.9	3.43	2.54	10895	86.3	6.4	1.69	0.58	14197
1.60 - 1.90	4.4	28.4	3.55	2.86	10301	90.7	7.5	1.78	0.69	14008
1.90 - 2.20	1.7	37.7	5.06	4.49	8768	92.4	8.0	1.84	0.76	13912
SINK - 2.20	7.6	66.3	8.83	8.59	4464	100.0	12.5	2.38	1.36	13194

TABLE 8 (CONTINUED)
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 1 1/2 INCH TOP SIZE

SPECIFIC GRAVITY	DIRECT ANALYSIS					CUMULATIVE ANALYSIS				
	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
				1-1/2 INCH X 0 (100.0% of TOTAL 1-1/2 INCH X 0)						
FLOAT - 1.30	43.3	4.3	1.55	0.40	14574	43.3	4.3	1.55	0.40	14574
1.30 - 1.35	18.6	9.2	1.89	0.79	13674	61.9	5.8	1.65	0.51	14304
1.35 - 1.40	11.2	14.3	2.43	1.39	12749	73.1	7.1	1.77	0.65	14065
1.40 - 1.50	8.1	22.9	3.36	2.39	11226	81.2	8.7	1.93	0.82	13783
1.50 - 1.60	3.2	30.0	3.85	2.96	10036	84.4	9.5	2.00	0.90	13639
1.60 - 1.90	6.4	36.2	4.25	3.56	9003	90.9	11.4	2.16	1.09	13311
1.90 - 2.20	1.3	40.2	6.93	6.36	8360	92.2	11.8	2.23	1.17	13241
SINK - 2.20	7.8	72.0	5.65	5.41	3695	100.0	16.5	2.50	1.50	12493
MINUS 100 MESH	4.6	14.2	2.49	1.95	12769	100.0*	16.4*	2.49*	1.52*	12506*

* These are cumulative values for the FLOAT-SINK Plus the Minus 100 MESH.

TABLE 9
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 3/8 INCH TOP SIZE

SPECIFIC GRAVITY	DIRECT ANALYSIS					CUMULATIVE ANALYSIS				
	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
3/8 INCH X 14 MESH (68.3% of 3/8 INCH X 100 MESH)										
FLOAT - 1.30	42.1	4.3	1.54	0.38	14581	42.1	4.3	1.54	0.38	14581
1.30 - 1.35	18.8	8.5	1.83	0.73	13803	60.9	5.6	1.63	0.49	14341
1.35 - 1.40	9.6	12.6	2.22	1.19	13057	70.5	6.6	1.71	0.58	14166
1.40 - 1.50	7.4	19.0	2.71	1.74	11918	77.9	7.7	1.80	0.69	13952
1.50 - 1.60	3.3	20.9	3.52	2.65	11585	81.2	8.3	1.87	0.77	13856
1.60 - 1.90	7.5	30.4	4.42	3.74	9966	88.7	10.2	2.09	1.02	13527
1.90 - 2.20	1.7	34.8	5.46	4.90	9239	90.4	10.6	2.15	1.10	13447
SINK - 2.20	9.6	91.9	6.38	6.09	1139	100.0	18.4	2.56	1.58	12265
14 MESH X 28 MESH (15.1% of 3/8 INCH X 100 MESH)										
FLOAT - 1.30	57.3	3.2	1.46	0.30	14786	57.3	3.2	1.46	0.30	14786
1.30 - 1.35	15.6	8.5	1.75	0.65	13803	72.9	4.3	1.52	0.37	14576
1.35 - 1.40	6.9	12.3	2.36	1.33	13111	79.8	5.0	1.59	0.46	14449
1.40 - 1.50	5.0	17.3	2.71	1.74	12217	84.8	5.7	1.66	0.53	14317
1.50 - 1.60	2.7	18.8	3.97	3.10	11953	87.5	6.1	1.73	0.61	14244
1.60 - 1.90	3.5	24.8	4.53	3.85	10912	91.0	6.8	1.84	0.74	14116
1.90 - 2.20	1.6	31.4	6.34	5.78	9799	92.6	7.3	1.92	0.82	14042
SINK - 2.20	7.4	85.2	8.13	7.84	1961	100.0	13.0	2.38	1.34	13148

TABLE 9 (CONTINUED)
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 3/8 INCH TOP SIZE

SPECIFIC GRAVITY	DIRECT ANALYSIS					CUMULATIVE ANALYSIS				
	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
28 MESH X 100 MESH (16.6% of 3/8 INCH X 100 MESH)										
FLOAT - 1.30	61.9	2.9	1.41	0.25	14843	61.9	2.9	1.41	0.25	14843
1.30 - 1.35	11.3	7.5	1.65	0.55	13987	73.2	3.6	1.45	0.30	14711
1.35 - 1.40	6.6	11.3	1.48	0.45	13292	79.8	4.2	1.45	0.31	14594
1.40 - 1.50	5.0	17.0	3.60	2.63	12270	84.8	5.0	1.58	0.45	14457
1.50 - 1.60	2.8	17.1	3.43	2.56	12253	87.6	5.4	1.64	0.51	14386
1.60 - 1.90	3.7	22.1	4.03	3.35	11377	91.3	6.1	1.73	0.63	14264
1.90 - 2.20	1.8	31.3	4.97	4.41	9816	93.1	6.5	1.80	0.70	14178
SINK - 2.20	6.9	82.3	9.96	9.67	2327	100.0	11.8	2.36	1.32	13360
3/8 INCH X 0 (100.0% of TOTAL 3/8 INCH X 0)										
FLOAT - 1.30	47.7	3.8	1.50	0.34	14675	47.7	3.8	1.50	0.34	14675
1.30 - 1.35	17.1	8.4	1.80	0.70	13823	64.8	5.0	1.58	0.43	14450
1.35 - 1.40	8.7	12.4	2.14	1.11	13093	73.4	5.9	1.64	0.51	14290
1.40 - 1.50	6.6	18.6	2.82	1.85	11996	80.1	6.9	1.74	0.62	14099
1.50 - 1.60	3.1	20.0	3.57	2.70	11732	83.2	7.4	1.81	0.70	14010
1.60 - 1.90	6.3	29.1	4.39	3.71	10184	89.5	8.9	1.99	0.91	13743
1.90 - 2.20	1.7	33.7	5.50	4.94	9420	91.2	9.4	2.06	0.99	13662
SINK - 2.20	8.8	89.8	7.07	6.78	1397	100.0	16.5	2.50	1.50	12580
MINUS 100 MESH	8.6	14.1	2.34	1.85	12787	100.0*	16.3*	2.49*	1.53*	12598*

* These are cumulative values for the FLOAT-SINK plus the Minus 100 MESH

TABLE 9A
DETAILED WASHABILITY ANALYSES OF A SIMULATED UPPER FREEPORT
COALBED CRUSHED TO A 28 AND 200 MESH TOP SIZES

SPECIFIC GRAVITY	DIRECT ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)	CUMULATIVE ANALYSIS WEIGHT (%)	ASH (%)	TOTAL SULFUR (%)	PYRITIC SULFUR (%)	CALORIFIC VALUE (BTU/LB)
28 MESH X 0 (100.0% of TOTAL 28 MESH X 0)										
FLOAT - 1.27	51.7	3.7	1.42	0.27	14693	51.7	3.7	1.42	0.27	14693
1.27 - 1.30	13.9	8.8	1.66	0.57	13748	65.6	4.8	1.47	0.33	14493
1.30 - 1.40	15.6	17.2	2.13	1.14	12235	81.2	7.2	1.60	0.49	14059
1.40 - 1.60	9.0	38.6	3.52	2.78	8623	90.2	10.3	1.79	0.72	13517
1.60 - 1.80	2.8	56.9	5.47	4.95	5810	93.0	11.7	1.90	0.84	13285
SINK - 1.80	7.0	80.1	10.41	10.17	2610	100.0	16.5	2.50	1.50	12537
200 MESH X 0 (100.0% of TOTAL 200 MESH X 0)										
FLOAT - 1.27	50.7	3.1	1.36	0.20	14805	50.7	3.1	1.36	0.20	14805
1.27 - 1.30	2.8	5.6	1.48	0.35	14338	53.5	3.2	1.37	0.21	14781
1.30 - 1.40	16.8	7.5	1.58	0.47	13987	70.3	4.2	1.42	0.27	14591
1.40 - 1.60	14.8	15.6	2.13	1.12	12519	85.1	6.2	1.54	0.42	14231
1.60 - 1.80	4.1	33.1	3.05	2.25	9518	89.2	7.4	1.61	0.50	14014
SINK - 1.80	10.8	91.5	9.83	9.73	1187	100.0	16.5	2.50	1.50	12629

APPENDIX J

INFORMATION REQUIREMENTS FOR THE NATIONAL ENVIRONMENTAL POLICY ACT

NOTE: The information described in this Appendix need not be submitted with the proposal.

This Appendix is intended for the proposer's information to assist with planning the project. The information discussed herein will be required after award.

Information Requirements for the National Environmental Policy Act

The Participant must develop and deliver to DOE a detailed, self-contained Volume of Environmental Information describing the environmental aspects and projected impacts of the project. This information is necessary in order for DOE to fulfill its responsibilities under the National Environmental Policy Act of 1969 (NEPA). In meeting those responsibilities, DOE is required to conform to the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, 40 CFR Parts 1500-1508 and DOE Regulations for implementation of NEPA (10 CFR Part 1021). It should be noted that DOE's NEPA responsibilities must be fulfilled before it can share project costs beyond Phase 1 project activities. To minimize the risk of project delays, therefore, it is imperative that the Participant consider carefully the effort and schedule required to prepare the Volume of Environmental Information described herein.

This Appendix is intended to provide guidance to the Participant concerning the types and extent of information required, but is not to be interpreted as containing all necessary or sufficient requirements for any given project. In some cases, the guidance may not be applicable to the Participant's project while, in other cases, the detail given may not be sufficient to cover all applicable environmental, health, safety, and socioeconomic impacts. The level of information should be compatible with the nature of the project and its stage of development. The Participant should keep in mind, however, that the environmental information required must be sufficient for DOE to prepare the appropriate documentation necessary to fulfill its obligation under NEPA to fully disclose the environmental impacts that DOE foresees as a consequence of any particular project.

Guidelines for the content of the Volume of Environmental Information follow.

SUMMARY

The Participant should prepare a short summary of the environmental, health, safety, and socioeconomic information and analysis. The summary should focus on:

- o the potential beneficial and detrimental environmental, health, safety, and socioeconomic impacts which will result from the project;
- o the major environmental, health, safety, and socioeconomic risks to construct, operate, maintain, and dismantle or dispose of the proposed facility;
- o conclusions which can be made about the significance of predicted environmental, health, safety, and socioeconomic effects;
- o anticipated near-term changes or additions covered by applicable environmental and other regulations, and related plans to use best control technology and practices economically feasible to meet the anticipated requirements;
- o alternatives available for meeting regulations and mitigating impacts; and,
- o all unresolved environmental, health, safety, and socioeconomic issues and unquantifiable effluents/emissions which may affect the validity of the impact analysis, especially the details for which information is not available at this stage of project development.

PROPOSED ACTION AND ITS ALTERNATIVES

This section should provide the following information as it relates to facility requirements, overall plant site and setting, and the plant/process residuals, as appropriate. The description should be sufficient to identify potential environmental impacts.

- o Project resource requirements, including energy form and quantity, land, water, labor, construction and operation materials, etc.

- Project site plan and topographic maps, if appropriate, including:

  - description of physical setting, structures, transportation corridors, and nearby bodies of water

  - description of fuel and waste storage areas, drainage and runoff patterns

- Offsite facility requirements including:

  - depth of ground water and

  - location of floodplains and wetlands

  - pipelines and transmission lines,

  - transportation access (rail, road, barge),

  - water intake and discharge, and

  - waste treatment disposal or recycling/reuse facilities.

- In-plant and off-site discharges, and on-site waste storage during construction, operation, maintenance, and disposition of the project including

  - quantity, physical and chemical description of air emissions (including fugitive emissions), liquid effluents, solid wastes, and other discharges (including heat, noise, and odor).

  - identify process streams, feedstocks, wastes and other substances handled or stored on-site that conceivably might leak or be accidentally released and which could pose risks to employee and/or public health and safety. Indicate their composition and the magnitude of stored amounts and throughput rates.

- identification of existing, and where possible, anticipated standards for those areas of environmental concern that are regulated, with a comparison between those standards and expected emissions.

- description of mitigative measures employed in the project to reduce potential negative environmental effects.

- where uncertainties exist about the performance of control and mitigative methods, describe alternative control and mitigative methods that are reasonably available in the event that the predicted effectiveness of proposed methods is not achieved.

o A complete description of likely alternatives being considered for the project. These alternatives might include such aspects as process design configurations (e.g., coal delivery by barge vs. rail, or hot gas vs. cold gas cleanup, etc.), and site specific considerations such as alternative waste disposal sites, etc. Discussions should not include alternative sites or technologies which may have been considered, but subsequently rejected, while preparing the proposal.

EXISTING ENVIRONMENT

This section provides a description of the environmental setting of the proposed project. It is expected that proposers will use the most recent existing data sources (i.e., Census, EPA and USGS for ambient air and surface water monitoring, and appropriate state and federal agencies and publications, etc.). Data from these and others sources are generally readily available and can be easily accessed.

o Description, using visuals as appropriate, of project site sufficient to identify all potential environmental impacts.

- description of physical appearance,

- description of existing landforms such as drainage areas, runoff areas, etc.,

- location and description of floodplains and wetlands, and

- description of existing offsite facilities such as pipelines and transmission lines, transportation access, water sources, etc.

o Description of environmental setting including a description of the environmental conditions based on available or existing information prior to the proposed project. The description should provide sufficient information to permit independent evaluation by reviewers of factors that are likely to be affected by the proposed project, and should include photographs or illustrations to provide the reviewers with visual orientation to the existing environment. USGS maps may also be useful to relate the conditions described to specific areas.

The following environmental factors may be applicable if the "Consequences of Project" section below indicates a potential significant change from existing conditions. If sampling data are used to describe the environmental conditions, the relationship of the sampling point to the proposed facility should be shown.

- atmospheric conditions, including downwind conditions; identification of affected air quality control region(s); local climate conditions; existing ambient air quality; conditions/features downwind that may be impacted.

- hydrologic conditions, including identification of watershed and downstream drainage; surface and groundwater quality to be impacted; conditions downstream or within drainage areas including flood plains; unique aquatic habitats; water recreation areas and public water supplies; hydrologic hazard such as flood or storm runoff.

- geologic conditions including erosion potential; seismic hazards; topographic stability and features; description of formations and faulting; productivity of soil, soil species.

- ecological conditions including state and federally listed endangered species; and their habitats; major flora, fauna, and wildlife; unique ecological or sensitive communities or habitats, such as wetlands and/or floodplains.

- socioeconomic conditions including population, migrational trends, employment and labor mix, available public services.

- aesthetic conditions including scenic vistas, historic/archaeological sites, cultural values.

- Native American tribal or other religious practices at or near the proposed project.

- identification of any other energy or chemical complexes existing or planned sufficiently close to the site to cummulatively impact environmental, health, safety, or socioeconomic factors.

CONSEQUENCES OF THE PROJECT

This section should contain the following information concerning impacts and consequences of the project (at selected site and the alternative sites, if appropriate). Plans for mitigating such impacts should be included. This section should also include a summary and ranking of all expected consequences in the approximate order of decreasing risk to project implementation. The ranking within each subsection should be based on consideration of items such as: a) nature and magnitude of impact; b) uncertainty in the effectiveness of proposed environmental controls; c) lack of definitive data on plant emissions and waste streams; and, d) uncertainties in anticipated regulations.

Detail of subsequent discussion should be commensurate with expected impacts.

Consequences of Construction

- o Overall description of construction activities, including disruption, duration, schedule, etc.

- o Environmental, health, and safety impacts, including:

  - atmospheric impacts, including projection of air quality changes;

  - hydrologic impacts, including changes in groundwater/surface water quality and quantity, and stream diversion;

  - land use impacts during and after construction activities;

  - public and occupational health consequences of construction activities, including accidents; and

  - ecological impacts, including any construction proposed in wetlands, floodplains, or other ecologically sensitive terrain.

- o Socioeconomic impacts.

Consequences of Operation and Disposition

- o Environmental, health, and safety impacts as a result of project operation and disposition including mitigative measures, and an indication if impacts from other "nearby" planned energy or chemical complexes are expected to occur. Describe the measures, if any, planned for mitigation of cummulative impacts. Indicate what type of follow-up data collection, monitoring and response procedures will be followed to detect impacts, confirm the performance of mitigating measures, and respond to potential problems.

  - Atmospheric impacts, including projection of air quality changes (give indication of atmospheric models used, if used in projection).

  - Hydrologic impacts, including changes in groundwater/surface water quality and quantity, from runoff from storage piles, leachates from waste disposal sites and wastewater cleaning and discharges.

  - Land use impacts resulting from solid waste disposal (including toxic and hazardous substances) or other discharges.

- Geologic impacts, including subsidence, seismicity, erosion, stream diversion, flood plain and wetlands intrusion, soil permeability and infiltration, integrity of solid waste disposal sites, etc.

- Public and occupational health and safety impacts, including exposure to toxic and hazardous substances, noise, odor, and potential accidents.

- Ecological impacts.

- Impact on regional or local plans for fuel, water resources, solid waste, land, air quality and labor force.

- Irreversible/irretrievable commitment of resources and opportunities to reuse and recycle resources (wastes, water).

- Socioeconomic impacts.

- Aesthetic impacts, including visual impacts.

- Impact on Native American tribal or other religious practices and sites; and potential impact on community character.

Impacts of Alternatives to the Project

o Environmental, health, and safety impacts of likely alternatives being considered for the project. These alternatives might include such aspects as process design configurations (e.g., coal delivery by barge vs. rail, or hot gas vs. cold gas cleanup, etc.), and site specific considerations such as alternative waste disposal sites, etc. The alternatives and their projected impacts should be discussed in relation to a no-action alternative at the site. Discussions should not include alternative sites or technologies which may have been considered, but subsequently rejected, while preparing the proposal.

REGULATORY COMPLIANCE

This section should identify all of the environmental laws and regulations (federal, state, and local) for which compliance will be necessary prior to implementation of the project. The participant should discuss the following:

- Preliminary description of best available control technology and feasible practices that would be employed to obtain compliance with identified environmental and occupational requirements.

- Any nonattainment areas and the substances involved

- Preliminary assessment of environmental monitoring requirements, and tentative schedule to file for and obtain all permits.

- Lowest available emission requirements; if applicable.

INFORMATION NECESSARY FOR EVALUATING IMPACTS TO WATER RESOURCES

Previously, the Water Resources Council developed assessments of water resource requirements and water supply availability for any non-nuclear energy technology research and development project under the Federal Non-nuclear Energy Research and Development Act. Since the Water Resource Council is no longer a functioning body of the Federal Government, water assessments are no longer required. However, because the Clean Coal Technology Program may result in projects for which water resource requirements and water availability may be important issues, the following information should be included in the NEPA documentation prepared for those projects to the extent applicable:

1. Provide data on water supply and demand within the geographical area of the proposed project;

2. Discuss any constraints upon water availability imposed by treaties, compacts, court decree, state water laws, and water rights granted pursuant to state and federal law;

3. Assess the effects of the project on regional water quantity and quality;

4. Estimates the costs associated with production and management of the required water supply, and the cost of disposal of waste water generated by the proposed project; and,

5. Assessment the environmental, social, and economic impact of any change in use of currently utilized water resources that may be required by the proposed project.

If water resource requirements and water availability are not significant issues, information should be included in the NEPA documentation to substantiate this fact.

APPENDIX K

COST ESTIMATE EXHIBITS

EXHIBIT A

(This exhibit uses the WBS developed for the technical proposal as a basis for development of the project's costs estimate. The following is the format to be used for the various Phases of the project. Each Phase should be prepared separately to WBS level 3, in turn. For this cost estimate the task amounts should total the Project Cost.)

SUMMARY FOR EXHIBIT A

1.0	TOTAL PROJECT COST	amount
1.1	PHASE ONE COST	amount
1.1.1	Task 1 Cost	amount
1.1.2	Task 2 Cost	amount
	(etc.)	
1.2	PHASE TWO COST	amount
	(etc.)	

(For this summary the task amounts should total the Phase amounts and the Phase amounts should total to the Project Cost. Costs which are not a part of a lower level's estimated cost should be identified and estimated in detail at the next higher task level. The Phase and Project totals from this Exhibit should equal the totals for the Phases and the Project in Exhibit A).

PHASE

(Identify the Phase being estimated)

WBS TASK

(Identify the WBS task number (task and subtask level) and provide a short description of the task.)

COST ESTIMATE

(Develop by cost element detail (material, labor (hours, rates), overheads, other direct costs, etc.) the costs for this task. Use the Pricing Proposal Summary as the format for the costs.)

EXHIBIT B

EQUIPMENT LIST

[Major equipment items should have been identified in the flowsheet that appears in Proposal Section II.B (see Instruction 5.3.2). This exhibit should detail costs of major equipment items using the following format.]

Major Equipment Item	Capacity	Cost	Installed Cost

EXHIBIT C

COST SHARING ARRANGEMENT

Estimated Cost

The total estimated cost for this proposed project is $******.

Cost Sharing

The participant and the Government shares in the proposed costs of this project are as follows:

SUMMARY OF THE PROPOSED SHARE
OF THE ACTUAL COST OF THE PROJECT

	DOLLAR SHARE (&)	PERCENT SHARE (%)
PHASE ONE		
GOVERNMENT		
Participant		
Cash		
Contribution		
PHASE TWO		
GOVERNMENT		
Participant		
Cash		
Contribution		

PHASE THREE

GOVERNMENT

Participant

Cash

Contribution

TOTAL PROJECT

GOVERNMENT

Participant

Cash

Contribution

(The participant share of the total project cost is to be the sum of the participant's cash and in-kind contribution.)

IDENTIFICATION AND SUPPORT FOR PARTICIPANT'S CASH AND IN-KIND CONTRIBUTIONS

The participant is to provide the following information for all cash and in-kind contributions proposed for each project phase.

Phase

(Phase 1, 2, or 3)

Type of Cost Share

(cash, or in-kind contributions)

Amount and Source of Cash Contribution

(Actual whole dollar amount and source of funds (e.g., participant, third party, subcontractor, etc.)

For each in-kind contribution, the following additional information must be provided. The information must be verifiable from the participant's records. Provide the information requested which is appropriate for the type of in-kind contribution being proposed.)

Source of In-Kind Contribution

(Participant, subparticipant, third party, etc.)

Description of In-Kind Contribution

(Type (property, equipment, land etc.) of in-kind contribution and brief description of expected use.)

Amount of Use

(Provide the total amount of time the item is available for use and the estimated amount of time the item will be used on/for this project.)

Proposed Value

(State estimated value. The estimated value will be developed following the procedures in OMB Circular 102, Attachment F, Paragraph 5 for state or local

government participants, or OMB Circular A-110, Attachment E, Paragraph 5 for all other participants.)

Date of Acquisition and Acquisition Cost

(Date when the item was originally purchased and original acquisition cost. Provide documentation to support original acquisition cost stated.)

Depreciation Status

(State if the item is fully depreciated or is currently being depreciated. For fully depreciated equipment or facilities provide evidence to show that it was continuously used during the entire Calendar Year 1984.)

Depreciation Amount

(Provide the yearly depreciation schedule and the years during which the depreciation took/takes place.)

APPENDIX L

MODEL COOPERATIVE AGREEMENT

DOE F 4600.1
(7-81)

U.S. DEPARTMENT OF ENERGY

NOTICE OF FINANCIAL ASSISTANCE AWARD

(See Instructions on Reverse)

Under the authority of Public Law _____ and subject to legislation, regulations and policies applicable to *(cite legislative program title)*:

1. PROJECT TITLE

2. INSTRUMENT TYPE
☐ GRANT ☐ COOPERATIVE AGREEMENT

3. RECIPIENT *(Name, address, zip code, area code and telephone no.)*

4. INSTRUMENT NO.

5. AMENDMENT NO.

6. BUDGET PERIOD
FROM: THRU:

7. PROJECT PERIOD
FROM: THRU:

8. RECIPIENT PROJECT DIRECTOR *(Name and telephone No.)*

10. TYPE OF AWARD
☐ NEW ☐ CONTINUATION ☐ RENEWAL
☐ REVISION ☐ SUPPLEMENT

9. RECIPIENT BUSINESS OFFICER *(Name and telephone No.)*

12. ADMINISTERED FOR DOE BY *(Name, address, zip code, telephone No.)*

11. DOE PROJECT OFFICER *(Name, address, zip code, telephone No.)*

13. RECIPIENT TYPE
☐ STATE GOV'T ☐ INDIAN TRIBAL GOV'T ☐ HOSPITAL ☐ FOR PROFIT ORGANIZATION ☐ INDIVIDUAL
☐ LOCAL GOV'T ☐ INSTITUTION OF HIGHER EDUCATION ☐ OTHER NONPROFIT ORGANIZATION ☐ C ☐ P ☐ SP ☐ OTHER *(Specify)*

14. ACCOUNTING AND APPROPRIATIONS DATA

a. Appropriation Symbol	b. B & R Number	c. FT/APP/OC	d. CFA Number

15. EMPLOYER I.D. NUMBER/SSN

16. BUDGET AND FUNDING INFORMATION

a. CURRENT BUDGET PERIOD INFORMATION

(1) DOE Funds Obligated This Action $ _____
(2) DOE Funds Authorized for Carry Over $ _____
(3) DOE Funds Previously Obligated in this Budget Period $ _____
(4) DOE Share of Total Approved Budget $ _____
(5) Recipient Share of Total Approved Budget $ _____
(6) Total Approved Budget $ _____

b. CUMULATIVE DOE OBLIGATIONS

(1) This Budget Period *[Total of lines a.(1) and a.(3)]* $ _____
(2) Prior Budget Periods $ _____
(3) Project Period to Date *[Total of lines b. (1) and b. (2)]* $ _____

17. TOTAL ESTIMATED COST OF PROJECT $ _____

(This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)

18. AWARD/AGREEMENT TERMS AND CONDITIONS

This award/agreement consists of this form plus the following:

a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement)

b. Applicable program regulations *(specify)* _____ *(Date)* _____

c. DOE Assistance Regulations, 10 CFR Part 600, as amended, Subparts A and ☐ B (Grants) or ☐ C (Cooperative Agreements)

d. Application/proposal dated _____, ☐ as submitted ☐ with changes as negotiated

19. REMARKS

20. EVIDENCE OF RECIPIENT ACCEPTANCE

(Signature of Authorized Recipient Official) *(Date)*

(Name)

(Title)

21. AWARDED BY

(Signature) *(Date)*

(Name)

(Title)

INSTRUCTIONS

(This form shall be completed in accordance with the following instructions. For any clarification or additional information that might be needed, consult the appropriate section of the DOE Financial Assistance Procedures Manual (DOE-FAPM).

Insert in the space provided, in the line which begins, "Under the Authority of Public Law . . .," the number and the name of the Public Law which authorizes this award. On the line below, enter the title of the pertinent program.

Block 1 - Enter the project title as it appears in the SF-424 or equivalent application/proposal face sheet.

Block 2 - Place a checkmark in the box beside the appropriate financial assistance instrument.

Block 3 - Enter the name, address and telephone number of the applicant/proposer as it appears in the SF-424 or equivalent application/proposal face sheet.

Block 4 - Enter the instrument number. (See DOE-FAPM.)

Block 5 - Enter the appropriate amendment number. (See DOE-FAPM for guidance.)

Block 6 - Enter the starting date and expiration date for the current budget period. If a budget period is being changed, enter the starting date and expiration date for the budget period, as changed.

Block 7 - Enter the starting date and anticipated completion date for the project. If a project period is being changed, enter the starting date and anticipated completion date for the project period, as changed.

Block 8 - Enter the name and telephone number of the individual designated by the applicant/proposer as the director of the project.

Block 9 - Enter the name and telephone number of the individual designated by the applicant/proposer as the contact for all business matters.

Block 10 - Place a checkmark in the box opposite the term which identifies the type of action being taken. (The terms are defined in the DOE-FAPM.)

Block 11 - Enter the name, address and telephone number of the individual designated by the DOE program office as the project officer.

Block 12 - Enter the name, address and telephone number of the individual/organization who will administer the agreement for DOE.

Block 13 - Place a checkmark in the box beside the applicable recipient type. If the recipient is a for-profit organization also check one of the lower boxes as follows: "C" for Corporation, "P" for Partnership and "SP" for Sole Proprietorship. If the recipient is of a type not indicated place a checkmark in the box beside "Other," and identify the recipient type in the space provided.

Block 14 - Enter where indicated, the appropriation symbol, B&R number, Fund Type (FT)/AFP Code (AFP)/Objective Class (OC) and CFA Number from the Procurement/Financial Assistance Request Authorization (DOE Form PR-799A). Completion of Block 14.d. is required only for awards made by Headquarters.

Block 15 - Enter the applicant's/proposer's Federal Employer Identification No. from the SF-424 or equivalent application/proposal face sheet, or if the applicant/proposer is an individual, enter his/her social security number.

Block 16 - Entries should be made as follows. (If no dollar entry is appropriate a zero should be entered to indicate there was no error of omission.)

Line a.(1) - Enter the amount of DOE funds obligated by this action.

Line a.(2) - Enter the amount of DOE funds not expended in prior budget period(s), if any, authorized by DOE for expenditure in the current budget period.

Line a.(3) - Enter the amount of DOE funds previously obligated in the current budget period.

Line a.(4) - Enter DOE's share of the total approved budget shown on Line a.(6).

Line a.(5) - Enter the recipient's share of the total approved budget shown on Line a.(6).

Line a.(6) - Enter the total approved budget for the current budget period. (Add the amounts in lines a.(4) and a.(5).)

Line b.(1) - Enter the amount of DOE funds obligated in the current budget period. (Add the amounts in lines a.(1) and a.(3).)

Line b.(2) - Enter the amount obligated by DOE in prior budget periods.

Line b.(3) - Enter the amount obligated by DOE in the project period to date. (Add the amounts in lines b.(1) and b.(2).)

Block 17 - Must be completed for cooperative agreements. Contracting Officers may exercise discretion as to whether to complete it for grants. Enter in the blank provided, the amount which represents the current estimate of total funds and dollar value of in-kind contributions (both DOE and recipient shares) needed to carry out the entire project. Include all funds and contributions previously provided, those being provided by this action, and all anticipated future obligations and contributions of both parties.

Block 18 - Complete as follows:

Item a. - No entry necessary.

Item b. - Enter the legal citation from the Code of Federal Regulations or Federal Register and the effective date for the program regulations applicable to the program under which the award is made.

Item c. - Mark the box beside B for grants or C for cooperative agreements.

Item d. - In the blank provided, enter the date of the application/proposal. (If SF-424 is used, see block 23c on page 1.) Place a checkmark in the appropriate box to indicate whether the application/proposal was accepted as submitted or with negotiated changes.

Block 19 - Enter any explanation or advisory comments which are required for, or applicable to, this action.

Block 20 - Will be completed by the recipient.

Block 21 - The Contracting Officer shall sign and date the top line. His/her name and title should be entered on the next two lines. This box must be signed prior to forwarding to recipient.

U.S. GOVERNMENT PRINTING OFFICE: 1981—522-056/4470

CONTENTS OF THE MODEL COOPERATIVE AGREEMENT

CONTENTS (continued)

SCHEDULE OF ARTICLES

ARTICLE I. STATEMENT OF JOINT OBJECTIVES

(A) Primary Objective

The primary objective of this Cooperative Agreement is to conduct a cost-shared project that will demonstrate [*insert name of technology*]. The parties anticipate that, if the demonstration project is successful, the [ ] technology could become commercialized during the 1990's and will be capable of (1) achieving significant reductions in the emissions of sulfur dioxide and/or the oxides of nitrogen from existing facilities to minimize environmental impacts such as transboundary and interstate pollution and/or (2) providing for future energy needs in an environmentally acceptable manner.

(B) Technical Objectives of the Demonstration Project

[*INSERT SUMMARY DESCRIPTION OF SPECIFIC TECHNICAL OBJECTIVES OF THE DEMONSTRATION PROJECT*]

(C) Legal Authority for this Cooperative Agreement

The expenditure of DOE funds under this Cooperative Agreement is subject to the requirements of Pub. L. 100-446. Except as otherwise expressly provided in Pub. L. 100-446 or by the terms of this Cooperative Agreement, the parties shall comply with the applicable provisions of Subparts A, C, and _____ of the DOE Financial Assistance Rules, 10 CFR Part 600. [*Insert "D and "E" in the blank if the Participant is a State or local government or an Indian tribe; insert "B" for all other types of Participants.*]

ARTICLE II. DEFINITIONS

"Budget" means the financial expenditure plan (submitted by the Participant in its proposal, in any pre-award amendments to its proposal, and in any

continuation applications) for carrying out the project. The budget includes the cost-sharing the Participant is required to provide and, for Phase 3 (Operation), shall include the fixed and variable allowable costs of operating the demonstration facility.

"Budget period" means the interval of time, specified in Article V of this Cooperative Agreement, into which the project is divided for budgeting and funding purposes.

"Continuation award" means an award for a succeeding or subsequent budget period after the first budget period of this Cooperative Agreement.

"Contracting Officer" means the DOE official authorized to execute awards and amendments thereto on behalf of DOE and who is responsible for the business management and non-program matters relating to this Cooperative Agreement.

"Contracting Officer's Technical Representative (COTR)" means the DOE authorized representative for all technical matters pertaining to the Cooperative Agreement.

"Cooperative Agreement" means this agreement between the United States Department of Energy (DOE) and the Participant, DOE Instrument Number _____, and any subsequent amendments.

"Cost-sharing" means the portion of the allowable direct and indirect project costs required to be borne by the Participant.

"DOE" means the United States Department of Energy and any successor department or agency.

"Government" means the government of the United States, including DOE.

"NEPA" means the National Environmental Policy Act of 1969, 42 U.S.C. § 4321 et seq.

"Participant" means [*INSERT NAME OF ORGANIZATION SIGNING THE COOPERATIVE AGREEMENT*] and its successors and assigns.

"Prior approval" means documentation signed by a DOE Contracting Officer evidencing consent to the incurrence of a specific cost before it is incurred. The procedures for requesting prior approval are set forth in 10 CFR § 600.114 (e) or 600.430(f).

"Project" means the set of activities described in Attachment A, Statement of Work, that the Participant is required to perform during Phases 1, 2, and 3 of this Cooperative Agreement.

"Program income" means the gross income earned directly from any demonstration project activity supported with DOE funds during Phases 1, 2, and 3. Such income includes fees for services; fees or rental income for the use of real or personal property acquired with DOE funds; and income from the sale of fuel, byproducts, or energy generated by the demonstration project. Such income does not include interest on DOE funds; rebates, credits, discounts, refunds, etc. and any interest earned on any of the foregoing; or income from royalties and license fees.

"Pub. L. 100-446" means Title II of "an Act making appropriations for the Department of the Interior and related agencies for the fiscal year ending September 30, 1989, and for other purposes," specifically the provisions under the Department of Energy headings entitled, "Clean Coal Technology" (102 Stat. 1810-1811) and "Administrative Provisions, Department of Energy" (102 Stat. 1813-1814).

"Repayment Agreement" means the agreement made by the Participant in DOE Instrument Number _____ on _____, 1990, to repay the DOE share of costs paid under this Cooperative Agreement.

"Total approved budget" means the amount of costs authorized to be incurred during each budget period, as shown on the Notice of Financial Assistance Award, by the Participant and any of its contractors. The total approved budget consists of DOE funds for allowable direct and indirect costs and the Participant's required cost-sharing, and shall include the fair use value of in-kind contributions that will be made to carry out the project.

"United States" means the United States of America and its 50 states, the District of Columbia, the Commonwealth of Puerto Rico, and any possession or trust territory of the United States.

[*OTHER DEFINITIONS AS ARE APPROPRIATE*]

ARTICLE III. PROJECT MANAGEMENT

(A) Participant Role

The Participant shall be responsible for all aspects of project performance as set forth in the Statement of Work, Attachment A. All services, personnel, facilities, equipment, materials, and supplies shall be furnished by the Participant, unless otherwise specified under this Cooperative Agreement.

The Participant shall designate a Project Manager who shall serve as its authorized representative for the technical and administrative elements of all work to be performed under this Cooperative Agreement. The Project Manager shall be the single authorized point of contact for all communications between the Participant and DOE.

(B) DOE Role

DOE shall monitor the Participant's progress in performing the project, and shall, as indicated in this paragraph and in Article VIII, have a substantial role in project decision making. DOE also shall approve or disapprove all actions for which, by the terms of this Cooperative Agreement, the Participant is required to obtain DOE's approval.

(C) No Government Obligation to Third Parties

In connection with the performance of the Project, the Government shall have no obligation or responsibility to any contractor, subcontractor or other person who is not a party to this Cooperative Agreement. The foregoing limitation shall apply notwithstanding the Contracting Officer's prior approval or consent of any contract awarded by the Participant. The Participant shall be responsible, without recourse to DOE, for the resolution and satisfaction of all pre-award protests, contract administration issues, and contract disputes arising out of acquisitions related to the Project.

(D) Participant's Project Management Structure/Procedures

The Participant shall manage the project in accordance with the Project Management Plan which, as indicated in the Statement of Work, shall be submitted to DOE for approval. [*INSERT material which is pertinent and specific to the project.*]

ARTICLE IV. DESIGNATION OF THE DOE CONTRACTING OFFICER'S REPRESENTATIVES

Contract Specialist: (see Block 11 of the Notice of Financial Assistance Award)

COTR: (see Block 12 of the Notice of Financial Assistance Award)

Patent Counsel: _____

_____

_____

_____

The DOE Contracting Officer is the only Government representative authorized to accept the reports and other deliverables the Participant is required to provide under this Cooperative Agreement. The review and approval of such reports and other deliverables may be delegated to the Contracting Officer's authorized representatives.

The DOE Contracting Officer shall designate a COTR who shall have the authority to issue written Technical Advice which suggests redirecting the project work (e.g., by changing the emphasis among different tasks), or pursuing specific lines of inquiry likely to assist in accomplishing the Statement of Work. The COTR shall have the authority to approve or disapprove those technical reports, plans, and other technical information the Participant is required to submit to DOE for approval. The COTR is not authorized to issue and the Participant is not required to follow any Technical Advice which constitutes work which is not within the scope of the Statement of Work; which in any manner causes an increase or decrease in the

total estimated cost or in the time required for performance of the project; which has the effect of changing any of the terms or conditions of the Cooperative Agreement; or which interferes with the Participant's right to perform the project in accordance with the terms and conditions of this Cooperative Agreement.

ARTICLE V. KEY PERSONNEL

The personnel specified in this clause are considered to be essential to the project. Before permitting the Project Manager to be absent for more than three months and before diverting any key person to other work, the Participant shall notify the Contracting Officer reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on the project. No key person may be substituted without the Contracting Officer's approval. Such approval shall be obtained in advance of the substitution, except that the Contracting Officer may ratify a substitution which, because of exigent circumstances, was made before the Participant could request and/or obtain the Contracting Officer's approval.

	Name	Title
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

ARTICLE VI. PROJECT SITE AND ACCESS

The project shall be performed principally at the following site(s): [*identify location/address of project site*]. At the request of the DOE Contracting Officer or the COTR, the Participant shall provide Government

officials and interested members of the public as determined by DOE with access to the project site(s) to observe project operations at reasonable times and with reasonable limitations on the numbers of people during each visit.

ARTICLE VII. PROJECT PHASES AND ESTIMATED PROJECT COSTS

(A) Project Phases

The project period of this Cooperative Agreement is divided into three project phases (Design, Construction, and Operation) and [*INSERT NUMBER*] budget periods. [*The expected duration of each project phase and budget period will be established during negotiations.*]

(B) Total Estimated Project Costs

DOE and the Participant shall share in allowable direct and indirect project costs in the percentages up to the amounts shown below:

TOTAL ESTIMATED PROJECT COST			$ _____	
Pre-award	*	DOE share	$ _____	__#__ %
		Participant share	$ _____	_____ %
Phase 1		DOE share	$ _____	_____ %
		Participant share	$ _____	_____ %
Phase 2		DOE share	$ _____	_____ %
		Participant share	$ _____	_____ %
Phase 3		DOE share	$ _____	_____ %
		Participant share	$ _____	_____ %
Total		DOE share	$ _____	__#__ %
		Participant share	$ _____	_____ %

* Actual allowable incurred costs which shall be reimbursed as provided in Article XI of this Cooperative Agreement. [*The numbers inserted at # shall be identical.*]

ARTICLE VIII. PROJECT DECISION MAKING

(A) Project Evaluation.

Shortly after the beginning of each budget period except for the last one, the Participant shall submit a Project Evaluation Plan (Plan) for DOE review and approval. The Plan must identify and describe the criteria by which the technical and economic feasibility of the project, based on the Participant's accomplishments during the budget period, are to be evaluated.

The DOE-approved Plan shall be used by the Participant to prepare a Project Evaluation Report which shall be submitted no later than 60 days before the end of the budget period. DOE shall use the approved Plan in evaluating the Participant's Evaluation Report and in deciding whether any accompanying continuation application will be approved.

(B) Continuation Applications.

If the Participant wishes to continue the Project beyond the current budget period, the Participant shall submit, no later than 60 days before the end of the current budget period, a continuation application which contains the following:

1) The Project Evaluation Report which shall describe in detail the status of the project and the technical progress made during the budget period.

2) A detailed description of the Participant's plan for conducting the project during the next budget period.

3) A detailed budget by project phase for the next budget period, including the proposed value of each in-kind contribution and an estimate of unobligated balances (see Article XII (A)).

(C) Approval/Disapproval of Continuation Applications

DOE shall approve or disapprove a timely continuation application no later than 30 days before the expiration of the current budget period. DOE will approve the continuation application provided the criteria in the approved

Project Evaluation Plan are met and appropriated funds are available for the Project. In determining whether the criteria have been met, DOE will consider the Participant's Project Evaluation Report and other related information. DOE shall disapprove a continuation application if appropriated funds are unavailable or insufficient.

(D) Limitation of Cost Liability

If the Participant does not submit a continuation application (i.e., withdraws from the project) or if DOE does not make a continuation award, the liability of DOE shall be limited to its share of allowable costs incurred during the current and any previous budget period.

ARTICLE IX. PROJECT DEFINITION

Before the end of the first budget period, the Participant shall complete the project definition activities identified in the Statement of Work [as appropriate]. The Project Evaluation Report for this first budget period shall contain: an updated Project Management Plan; the Technology, Schedule, and Cost Baselines for all future project work, by phase, to be performed during each subsequent budget period; and all information requested by DOE to satisfy its obligations under NEPA. Before approval of the first Continuation Application, the Participant shall deliver to DOE the signed commitments/ agreements for any financing required to meet the Participant's total cost-sharing obligation under this Cooperative Agreement.

ARTICLE X. DOE FINANCIAL SUPPORT

(A) DOE Obligation

The maximum DOE obligation to the Participant is the amount identified in Block 16.b(3) of the Notice of Financial Assistance Award. DOE shall not be obligated to make any additional, supplemental, continuation, renewal, or other award for the same or any other purpose.

(B) Project Costs Not Allowed for Cost Sharing Purposes

(1) DOE shall not accept valuation for property sold, transferred, exchanged, or manipulated in any way to acquire a new basis for depreciation purposes or to establish a rental value in circumstances which would amount to a transaction undertaken solely for this Cooperative Agreement.
(2) Revenues or royalties from prospective operation of the project, after the end of the Cooperative Agreement or proceeds from the prospective sale of the assets of the project, or revenues or royalties from replication of the technology in future projects or plants, will not be considered cost sharing.
(3) Fully depreciated property will not receive any cost sharing value unless it has been in continuous use by the Participant during the entire calendar year 1988. (See Article X(C))
(4) Existing facilities, equipment, and supplies, or previously expended research or development funds are not cost sharing for the purposes of this Cooperative Agreement, except as amortized, depreciated, or expensed in normal business practice (see Article X(C) below). Contributions in the form of foregone revenues or replacement power costs are not considered as cost sharing.
(5) Patents, proprietary data, or prior work will not be valued in determining the Participant's cost participation in the project.
(6) The Participant may not charge allowable costs, which are absorbed into its share of cost participation, to the Government under other contracts, agreements, or grants. Additionally, other appropriated Federal funds are not cost-sharing for the purposes of this Cooperative Agreement except as provided in Pub. L. 100-446.
(7) The Participant can not consider foregone fee or profit for cost share purposes. The Government will not pay fee or profit to the Participant under this Cooperative Agreement.

(C) Project Costs Allowable for Cost Sharing Purposes

DOE shall share in allowable project costs in the percentages indicated in Article VII. The allowability of direct and indirect costs incurred in the performance of the project shall be determined in accordance with the cost principles set forth in _____ [*Insert reference to appropriate cost principles; refer to list in 10 CFR § 600.103 (b) and § 600.442.*] and the following:

(1) For fully depreciated property contributed to the project and in continuous use during the entire calendar year 1988, a fair use value for the life of the project will be assigned by DOE. The fair use value will be the annual average depreciation used by the Participant as permitted under statute or IRS regulations under which it was depreciated.

(2) The value that will be allowed for contributions of currently depreciating property and which are of relevance to the project is the depreciation schedule being used and allowed under statute or IRS regulations for the property. This depreciation will be limited in its cost share value to the depreciation claimed during the life of the demonstration project.

(3) Contributed land will be valued at its fair rental value for the period of the demonstration.

(4) Contributed land, equipment and facilities will be counted as cost sharing only for the periods during which they are brought into use for this project. For example, that portion of a facility used for housing the design team may be credited as a cost share during Phase 1, but contributed equipment incorporated in the construction may be credited as a cost share only during those portions of Phases 2 and 3 when used. Property owned by one of the project team members and made available to the project will be valued in agreement with the principles described above.

(5) Value for contributed equipment and facilities will be assigned only to the extent that the facility or equipment is project-related.

(6) The cost of disposal of the facility and equipment is an allowable cost if proposed and if accomplished prior to the end of the Cooperative Agreement.

(D) Program Income

Program income generated during Phase 3 may be used for cost-sharing to the extent that it does not exceed the variable costs of operation. Variable costs are those which are incurred only when the facility is in operation and generating products. Examples of such costs are consumed coal and water. An example of a cost which is otherwise allowable but is not a variable cost is labor expenses which would be incurred if the facility is in operation or not. Program income beyond that needed for variable operating costs may be used for any purpose.

ARTICLE XI. ALLOWABLE PRE-AWARD COSTS

The Participant shall be entitled to reimbursement of a portion of certain pre-award costs it incurred after selection provided such costs are related to (1) the preparation of material requested by DOE and identified as required for negotiations or (2) the preparation and submission of environmental data requested by the DOE to complete NEPA requirements for the project.

ARTICLE XII. BUDGET ADJUSTMENTS

(A) Unobligated Balances

As used in this paragraph, "unobligated balance" means the portion of DOE funds that has not been obligated by the Participant, and is determined by subtracting the DOE share of the cumulative costs incurred from the amount of DOE funds authorized for expenditure. When the Participant has unobligated balances of funds remaining at the end of any budget period except for the last one, such funds may be used in the subsequent budget period and shall be specified and included in the total approved budget shown in an amended Notice of Financial Assistance Award. Whenever it becomes apparent during the penultimate budget period, that the amount of DOE funding authorized is expected to exceed the Participant's needs by more than five percent of DOE's share of total allowable costs, the Participant must notify DOE. DOE may

reduce the award by an amount which does not exceed the total amount of excess funds.

(B) Budget Revisions

The Participant may rebudget funds within a total approved budget, subject to the prior approval requirements of 10 CFR § 600.114(b) and (e) or § 600.430(b) and (f). The Participant shall obtain prior written approval of the DOE Contracting Officer of any budget revision which would result in the need for additional DOE funding.

(C) Additional Funds

The Participant shall immediately notify the DOE Contracting Officer in writing whenever it becomes apparent that the costs of completing that portion of the project to be performed during the budget period exceeds the total approved budget. Such written notice shall, at a minimum, set forth (1) a detailed explanation of the factors causing the cost overrun; (2) a proposed budget revision detailing the amount of additional funds needed to complete the project; and (3) the amount of additional DOE funds, if any, the Participant is requesting.

DOE is under no obligation to provide additional funds. Under no circumstances shall the Participant incur any additional costs to be cost-shared by DOE under this Cooperative Agreement without the prior written approval of the DOE Contracting Officer.

(D) DOE/Participant Share of Additional Funds

DOE is under no obligation to award additional funds to pay for costs in excess of the Total Estimated Project Cost estimated as of the date of award. If additional DOE funds are awarded, DOE's share of the allowable costs will not exceed the DOE share of the Total Estimated Project Cost as shown in Article VII (B) as of the date of award. Under no circumstances will the total amount of additional DOE funds awarded exceed 25% of DOE's share of the

Total Estimated Project Cost indicated at block 17 of the initial Notice of Financial Assistance Award.

ARTICLE XIII. PAYMENT

(A) General

With the exception of the pre-award costs that will be reimbursed as provided in Article XI, DOE shall make advance payments by means of a letter of credit under which the Participant is authorized to draw Federal funds needed for immediate disbursement. [*If the Participant does not have a financial management system which meets the standards for fund control and accountability in 10 CFR § 600.109(b) or § 600.420, this paragraph will specify that the payment method shall be reimbursement by Treasury check (see 10 CFR §§ 600.112(c) and 600.421(d)).*]

(B) Limitation on Expenditures

DOE funds may not be expended by the Participant on construction or operation unless and until the Contracting Officer notifies the Participant in writing that all DOE obligations under NEPA have been satisfied.

ARTICLE XIV. RIGHTS IN INTELLECTUAL PROPERTY

The rights and obligations of the parties with respect to intellectual property are set forth in clauses numbered [*INSERT APPROPRIATE NUMBERS*] of Attachment B to this Cooperative Agreement and are hereby incorporated by reference.

ARTICLE XV. REPORTING REQUIREMENTS

Reports shall be submitted in accordance with the requirements of the Federal Assistance Reporting Checklist (Attachment C) which is hereby incorporated by reference.

ARTICLE XVI. PROCUREMENT

In selecting, awarding, and administering contracts under this Cooperative Agreement, the Participant shall abide by the requirements and goals set forth in this Article.

(A) Responsible Contractors

The Participant shall not award or approve or consent to the award of a contract to any party which is debarred or suspended or is excluded from or ineligible for participation in Federal assistance programs under the Governmentwide Debarment and Suspension (Nonprocurement) rules at 10 CFR Part 1036. Copies of these rules; the DOE Consolidated List of Debarred, Suspended, Ineligible and Voluntarily Excluded Awardees (DOE List); and the General Services Administration's (GSA) List of Parties Excluded from Federal Procurement or Nonprocurement Programs (Nonprocurement List) may be obtained from the DOE Contracting Officer.

(B) Procurement Goals

The Participant will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

(C) Contract Clauses

The Participant shall use the contract clauses in Attachment D which is hereby incorporated by reference. [*These are the known required clauses, othrs may be added to Attachment D during negotiations as appropriate.*]

ARTICLE XVII. INSURANCE AND INDEMNITY

In addition to any insurance which is required under paragraph (A) and which may be required under paragraph (B) of this Article, the Participant

shall acquire and thereafter maintain workmen's compensation, employer's liability, comprehensive general liability (bodily injury), and comprehensive automobile liability (bodily injury and property damage) insurance, and such other insurance coverage as the Participant normally carries for similar projects. With the approval of the DOE Contracting Officer, the Participant may maintain a self-insurance program for any of the coverages specified in this Article; provided that, with respect to workmen's compensation, the Participant is qualified under applicable statutory and regulatory authority. All insurance required pursuant to the provisions of this Article shall be in such form, in such amounts, for such periods of time, and provided by such insurance carriers as the DOE Contracting Officer may approve.

(A) Hazards (Property Damage)

The Participant will provide hazard insurance (theft, fire, windstorm, water damage, etc.) covering the materials, equipment, and structures acquired or constructed under this Cooperative Agreement. Proceeds from such insurance may be used to replace the damaged or destroyed property. If the Participant decides not to replace or repair the property, the insurance proceeds will be paid to DOE in the same ratio as the cost share formula applicable to the budget period of the Cooperative Agreement when the equipment or property was purchased.

(B) Flood Insurance

If funds under this Cooperative Agreement are used to acquire or construct property or equipment for use in an identified flood plain area in the United States having special flood, special flood-related erosion, or special mudslide (i.e., mud-flow) hazards, the Participant shall obtain flood insurance as required by the Flood Disaster Protection Act of 1973 (42 U.S.C. 4002, 4012a, 4105), as amended. Proceeds from such insurance may be used to replace the damaged or destroyed property. If the Participant decides not to replace or repair the property, the insurance proceeds will be paid to DOE in

the same ratio as the cost share formula applicable to the budget period of the Cooperative Agreement when the equipment or property was purchased.

(C) Indemnity

The Participant shall indemnify the Government and its officers, agents, or employees for any and all liability, including litigation expenses and attorneys' fees, arising from suits, actions, or claims of any character for death, bodily injury, or loss of or damage to property or to the environment, resulting from the fault or negligence of the Participant in performing the project under this Cooperative Agreement.

ARTICLE XVIII. BONDING FOR CONSTRUCTION

The Participant shall require any construction contractor or subcontractor to obtain performance and payment bonds for any construction project in accordance with practices approved by the Contracting Officer.

ARTICLE XIX. PROPERTY MANAGEMENT AND DISPOSITION

Title to all real property, equipment and supplies (excluding Government-furnished property) acquired by or on behalf of the Participant in connection with performance of the project shall vest upon acquisition in the Participant. The Participant shall make such property available for use in the project. During the period of this Cooperative Agreement, the Participant may, with the DOE Contracting Officer's prior approval, encumber its title to or dispose of such property.

The use, management, and disposition of all Government-furnished property shall be governed by 10 CFR § 600.117 [or 10 CFR §§ 600.431, 600.432, and 600.433].

ARTICLE XX. TERMINATION

(A) Termination by Mutual Agreement

This Cooperative Agreement may be terminated, in whole or in part, by mutual agreement at any time. The initiation and negotiation of such a termination shall be conducted in accordance with the procedures set forth in 10 CFR § 600.29(d).

(B) Termination for Cause

DOE may terminate the Cooperative Agreement, in whole or in part, for cause (i.e., on the basis of a noncompliance determination). DOE shall provide advance written notice, as required by 10 CFR § 600.28, of any noncompliance determination (with a minimum 30-day opportunity to cure the non-compliance) and of any subsequent decision to terminate for cause. The Cooperative Agreement may not be terminated for delays in performance caused by fires, floods, strikes, acts or omissions of the Government, acts of God, or similar causes which are beyond the control of the Participant.

(C) Effect of Termination

DOE shall have no liability for paying the costs of any new obligations incurred by the Participant after the effective date of the termination of this Cooperative Agreement (or portion thereof). DOE shall pay its share of all noncancellable obligations properly incurred by the Participant before the effective date of the termination.

ARTICLE XXI. DISPUTES AND APPEALS

The Participant shall have the right, as specified in 10 CFR § 600.26, to appeal to the Financial Assistance Appeals Board (the Board) any of the following adverse determinations or decisions:

1) A determination that the Participant has failed to comply with the terms and conditions of this Cooperative Agreement, with the requirements of 10 CFR Part 600, or with the requirements of Pub. L. 100-446;
2) A DOE decision not to make a continuation award based on any of the determinations described in the preceding paragraph, including any determination that the Participant's performance of the project has not met the requirements of the approved Project Evaluation Plan;
3) A DOE termination of this Cooperative Agreement, in whole or in part, for cause;
4) A DOE determination that this Cooperative Agreement is void or invalid;
5) The application by DOE of an indirect cost rate; and
6) DOE disallowance of costs, including those incurred after selection but before award.

A DOE decision not to make a continuation award which is based on the unavailability of sufficient appropriated funds or on the failure to satisfy NEPA requirements may not be appealed to the Board.

ARTICLE XXII. RECORDS RETENTION, ACCESS, AND DISCLOSURE

(A) Period of Retention

The Participant shall retain all financial and performance records, supporting documents, statistical records, and other records of the Participant which are required to be retained by the terms of this Cooperative Agreement, and any other records the Participant reasonably considers to be pertinent to this Cooperative Agreement. The period of required retention shall be from the date each such record is created or received by the Participant until three years after one of the following dates, whichever is latest: the expiration date of this Cooperative Agreement; the date the Participant's final expenditure report is submitted to DOE; or if this Cooperative Agreement is terminated in its entirety, the effective date of the termination. If any claim, litigation, negotiation, investigation, audit, or other action involving the records starts before the expiration of the three-year retention period, the Participant shall retain the records until such

action is completed and all related issues are resolved, or until the end of the three-year retention period, whichever is later.

(B) Authorized Copies

Copies made by microfilm, photocopying, or similar methods may be substituted for original records. Records originally created by computer may be retained on an electronic medium, provided such medium is "read only" or is protected in such a manner that the electronic record can be authenticated as an original record.

(C) Access to Records

DOE and the Comptroller General of the United States, or any of their authorized representatives, shall have the right of access to any books, documents, papers, or other records (including those on electronic media) which are pertinent to this Cooperative Agreement. The purpose of such access is limited to the making of audits, examinations, excerpts, and transcripts. The right of access described in this paragraph shall last as long as the Participant retains records which are pertinent to this Cooperative Agreement.

(D) Restrictions on Public Disclosure

The Federal Freedom of Information Act (5 U.S.C. § 552) does not apply to records the Participant is required to retain by the terms of this Cooperative Agreement. Unless otherwise required by law or a court of competent jurisdiction, the Participant shall not be required to disclose such records to the public.

ARTICLE XXIII. PUBLIC INFORMATION RELEASE

The Participant shall coordinate in advance with the DOE Contracting Officer or the COTR on all information to be issued by the Participant to the public concerning work performed under this Cooperative Agreement.

Information shall not be released to the public without first obtaining the approval of the DOE Contracting Officer or the COTR.

ARTICLE XXIV. LEGAL NOTICE/DISCLAIMER

The following notice shall be contained in all reports intended to be released to the public:

> This report was prepared by _____ pursuant to a cooperative agreement partially funded by the U.S. Department of Energy, and neither _____ nor any of its subcontractors nor the U.S. Department of Energy, nor any person acting on behalf of either:
>
> (A) Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately-owned rights; or
>
> (B) Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method or process disclosed in this report.
>
> Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the U.S. Department of Energy. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Department of Energy.

ARTICLE XXV. COMMERCIALIZATION

The Participant agrees to exercise its best efforts to commercialize, or to assist others to commercialize, in the United States, [*INSERT the name of the technology*].

ARTICLE XXVI. SEVERABILITY

If a court of competent jurisdiction or the DOE Financial Assistance Appeals Board determines that any part of this Cooperative Agreement is invalid, void, unenforceable, or inconsistent with any applicable Federal statute or regulation, such part shall be deemed to have been amended or deleted to conform to such determination.

ATTACHMENT A

STATEMENT OF WORK

ATTACHMENT B

INTELLECTUAL PROPERTY PROVISIONS

FOR

COST-SHARING COOPERATIVE AGREEMENT

INTELLECTUAL PROPERTY PROVISIONS FOR COST-SHARING COOPERATIVE AGREEMENT

Note to Participant:

In these clauses, the term "Contract" means Cooperative Agreement, and the term "Contractor" means Participant, unless the content of the clause clearly indicates otherwise. The use of the term "subcontractor" in any of the provisions means contractor to the Participant and all tiers of Subcontractor thereunder unless the conditions for use of a provision as set forth in the applicable regulations provide otherwise.

1. REPORTING OF ROYALTIES (10 CFR § 600.33 (C)(2))

If the Cooperative Agreement is in an amount which exceeds $10,000 and if any royalty payments are directly involved in the Cooperative Agreement or are reflected in the Cooperative Agreement price to the Government, the Participant agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this Cooperative Agreement and prior to its completion or final settlement, the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this Cooperative Agreement together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit the identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

2. AUTHORIZATION AND CONSENT (10 CFR § 600.33(b)(5))

The Government hereby gives its authorization and consent for all use and manufacture of any invention described in and covered by a patent of the United States in the performance of this Cooperative Agreement or any part hereto or any amendment hereto or any subcontract hereunder (including all lower tier subcontracts).

3. NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (10 CFR § 600.33(b)(6))

The provisions of this clause shall be applicable only if the amount of this Cooperative Agreement exceeds $10,000.

(a)The Participant shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Cooperative Agreement of which the Participant has knowledge.

(b)In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Cooperative Agreement or out of the use of any supplies furnished or work or services performed hereunder, the Participant shall furnish to the Government when requested by the Contracting Officer all evidence and information in possession of the Participant pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Participant has agreed to indemnify the Government.

(c)This clause shall be included in all subcontracts.

4. PATENT INDEMNITY (41 CFR § 9-9.103-3(b))

The Participant shall indemnify the Government and its officers, agents, and employees against liability, including costs, for infringement of U.S. Letters Patent (except U.S. Letters Patent issued upon an application which is now or may hereafter be kept secret or otherwise withheld from issue by order of the Government) resulting from the Participant's (a) furnishing or supplying standard parts or components which have been sold or offered for sale to public on the commercial open market; (b) utilizing its normal practices or methods which normally are or have been used in providing goods and services in the commercial open market in the performance of the Cooperative Agreement; or (c) utilizing any parts, components, practices, or methods to the extent to which the Participant has secured indemnification from liability. The foregoing indemnity shall not apply unless the Participant shall have been informed as soon as practicable by the Government of the suit or action alleging such infringement and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply to a claimed infringement which is settled without the consent of the Participant unless required by final decree of a court of competent jurisdiction or to an infringement resulting from addition to or change in such supplies or components furnished or construction work performed for which addition or change was made subsequent to delivery or performance by the Participant.

5. ADDITIONAL TECHNICAL DATA REQUIREMENTS (48 CFR § 952.227-73)

(a)In addition to the technical data specified elsewhere in this Cooperative Agreement to be delivered, the Contracting Officer may, at any time during the Cooperative Agreement performance or within 1 year after final payment, call for the Participant to deliver any technical data first produced or specifically used in the performance of this Cooperative Agreement, except technical data pertaining to items of standard commercial design.

(b)The provisions of the Rights in Technical Data clause included in this Cooperative Agreement are applicable to all technical data called for under this Additional Technical Data Requirements clause. Accordingly, nothing contained in this clause shall require the Participant to actually deliver any technical data, the delivery of which is excused by Paragraph (e) of the Rights in Technical Data clause.

(c)When technical data are to be delivered under this clause, the Participant will be compensated for appropriate costs for converting such data into the prescribed form for reproduction, and for delivery.

6. RIGHTS TO PROPOSAL DATA (10 CFR § 600.33(b)(1))

Except for technical data contained on pages ____ of the Participant's proposal dated _____ which are asserted by the Participant as

being proprietary data, it is agreed that, as a condition of the award of this Cooperative Agreement, and notwithstanding the provisions of any notice appearing on the proposal, the Government shall have the right to use, duplicate, disclose, and have others do so for any purpose whatsoever, the technical data contained in the proposal upon which this Cooperative Agreement is based.

7. PATENT RIGHTS -- SMALL BUSINESS FIRMS OR NONPROFIT ORGANIZATIONS (41 CFR § 9-9.107-56)

(a)Definitions.

(1)"Invention" means any invention or discovery which is or may be patentable or otherwise protectable under Title 35 of the United States Code (U.S.C.) or any novel variety of plant which is or may be protected under the Plant Variety Protection Act (7 U.S.C. 2321 et seq.).

(2)"Subject invention" means any invention of the Contractor conceived or first actually reduced to practice in the performance of work under this Cooperative Agreement, provided that in the case of a variety of plant the date of determination (as defined in section 44(d) of the Plant Variety Protection Act, 7 U.S.C. 2401(d) must also occur during the period of contract performance.

(3)"Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is utilized and that its benefits are, to the extent permitted by law or Government regulations, available to the public on reasonable terms.

(4)"Made" when used in relation to any invention means the conception or first actual reduction to practice of such invention.

(5) "Small business firm" means a small business concern as defined at Section 2 of P.L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of this clause, the size standard for small business concerns involved in Government procurement and subcontracting, at 13 CFR 121.3-8 and 13 CFR 121.3-12, respectively, will be used.

(6) "Nonprofit organization" means a university or other institution of higher education or an organization of the type described in Section 501(c)(3) of the Internal Revenue Code of 1954 (26 U.S.C. 501(c) and exempt from taxation under Section 501(a) of the Internal Revenue Code (26 U.S.C. 501(a)) or any nonprofit scientific or educational organization qualified under a state nonprofit organization statute.

(7) "Patent counsel" means the Department of Energy (DOE) patent counsel assisting the DOE contracting activity.

(b) Allocation of principal rights.

(1) The Contractor may retain the entire right, title, and interest throughout the world to each subject invention subject to the provisions of this clause and 35 U.S.C. 203. With resepct to any subject invention in which the

Contractor retains title, the Federal Government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world.

(2) (Reserved.)

(c) Invention disclosure, election of title and filing of patent application by Contractor.

(1) The Contractor will disclose each subject invention to the Patent Counsel within 2 months after the inventor discloses it in writing to Contractor personnel responsible for patent matters. The disclosure to the Patent Counsel shall be in the form of a written report and shall identify the Cooperative Agreement under which the invention was made and the inventor(s). It shall be sufficiently complete in technical detail to convey a clear understanding, to the extent known at the time of the disclosure of the nature, purpose, operation, and the physical, chemical, biological or electrical characteristics of the invention. The disclosure shall also identify any publication, on sale or public use of the invention and whether a manuscript describing the invention has been submitted for publication and, if so, whether it has been accepted for publication at the time of disclosure. In addition, after disclosure to the Patent Counsel, the Contractor will promptly notify the Patent Counsel of the acceptance of any manuscript describing the invention for publication or of any on sale or public use planned by the Contractor.

(2) The Contractor will elect in writing whether or not to retain title to any such invention by notifying the Patent Counsel within 2 years of disclosure to the Patent Counsel. However, in any case where publication, on sale or public use has initiated the 1-year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by Patent Counsel to a date that is no more than 60 days prior to the end of the statutory period.

(3) The Contractor will file its initial patent application on a subject invention to which it elects to retain title within 1 year after election of title or, if earlier, prior in the end of any statutory period wherein valid patent protection can be obtained in the United States after a publication, on sale, or public use. The Contractor will file patent applications in additional countries or international patent offices within either 10 months of the corresponding initial patent application or 6 months from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order.

(4) Requests for extension of the time for disclosure to the Patent Counsel, election, and filing, under subparagraphs (1), (2), and (3) may, at the discretion of the Patent Counsel be granted.

(d) Conditions when the Government may obtain title.

The Contractor will convey to the DOE, upon written request, title to any subject invention:

(1) If the Contractor fails to disclose or elect title to the subject invention within the times specified in (c) above, or elects not to retain title; provided that the DOE may only request title within 60 days after learning of the failure of the Contractor to disclose or elect within the specified times;

(2) In those countries in which the Contractor fails to file patent applications within the times specified in (c) above; provided, however, that if the Contractor has filed a patent application in a country after the times specified in (c) above but prior to its receipt of the written request of the Patent Counsel, the Contractor shall continue to retain title in that country; or

(3) In any country in which the Contractor decides not to continue the prosecution of any application for, to pay the maintenance fees on, or defend in a reexamination or opposition proceeding on, a patent on a subject invention.

(e) Minimum rights to Contractor and protection of the Contractor right to file.

(1) The Contractor will retain a nonexclusive royalty-free license throughout the world in each subject invention to which the Government obtains title except if the Contractor fails to disclose the subject invention within the times specified in (c) above. The Contractor's license extends to its domestic subsidiaries and affiliates, if any, within the

corporate structure of which the Contractor is a part and includes the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the Cooperative Agreement was awarded. The license is transferable only with the approval of DOE except when transferred to the successor of the part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic license may be revoked or modified by DOE to the extent necessary to achieve expeditious practical application of the subject invention pursuant to an application for an exclusive license submitted in accordance with applicable provisions at 37 CFR 404 and 10 CFR Part 781. This license will not be revoked in that field of use or the geographical areas in which the Contractor has achieved practical application and continues to make the benefits of the invention reasonably accessible to the public. The license in any foreign country may be revoked or modified at the discretion of DOE to the extent the Contractor, its licensees, or its domestic subsidiaries or affiliates have failed to achieve practical application in that foreign country.

(3) Before revocation or modification of the license, DOE will furnish the Contractor a written notice of its intention to revoke or modify the license, and the Contractor will be allowed 30 days (or such other time as may be authorized by DOE for good cause shown by the Contractor) after the notice to show cause why the license should not be revoked or modified. The Contractor has the right to appeal in accordance with 37 CFR 404 and 10 CFR Part 781, any decision concerning the revocation or modification of its license.

(f) Contractor action to protect the Government's interest.

(1) The Contractor agrees to execute or to have executed and promptly deliver to the Patent Counsel all instruments necessary to:

(i) Establish or confirm the rights the Government has throughout the world in those subject inventions to which the Contractor elects to retain title, and

(ii) Convey title to DOE when requested under (d) above and to enable the Government to obtain patent protection throughout the world in that subject invention.

(2) The Contractor agrees to require, by written agreement, its employees, other than clerical and nontechnical employees, to disclose promptly in writing to personnel identified as responsible for the administration of patent matters and in a format suggested by the Contractor each subject invention made under this Cooperative Agreement in order that the Contractor can comply with the disclosure provisions of (c)

above and to execute all papers necessary to file patent applications on subject inventions and to establish the Government's rights in the subject inventions. The disclosure format should require, as a minimum, the information required by (c)(1) above. The contract shall instruct such employees through the employee agreements or other suitable educational programs on the importance of reporting inventions in sufficient time to permit the filing of patent applications prior to United States or foreign statutory bars.

(3) The Contractor will notify the Patent Counsel of any decision not to continue prosecution of a patent application, pay maintenance fees, or defend in a reexamination or opposition proceeding on a patent, in any country, not less than 30 days before the expiration of the response period required by the relevant patent office.

(4) The Contractor agrees to include, within the specification of any United States patent applications and any patent issuing thereon covering a subject invention, the following statement "This invention was made with Government support under (identify the Cooperative Agreement) awarded by the Department of Energy. The Government has certain rights in this invention."

(5) The Contractor agrees to:

(i) Upon request, provide a report prior to the close-out of the Cooperative Agreement listing all subject inventions or stating that there were none;

(ii) Provide, upon request, a copy of the patent application, filing date, serial number and title, patent number and issue date for any subject invention in any country in which the Contractor has applied for a patent; and

(iii) Provide upon request but not more than annually, listings of all subject inventions which were disclosed to DOE during the applicable reporting period.

(g) Subcontracts.

(1) The Contractor will include this clause, suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, or research work to be performed by a small business firm or a domestic nonprofit organization. The subcontractor will retain all rights provided for the Contractor in this clause, and the Contractor will not, as part of the consideration for awarding the subcontract, obtain rights in the subcontractor's subject inventions.

(2) The Contractor will include in all other subcontracts, regardless of tier, for experimental, developmental, demonstration, or research work the patent rights clause of 41 CFR 9-9.107-5(a) or 9-9.107-6 as appropriate, modified to identify the parties.

(3) In the case of subcontracts at any tier, when the prime award with DOE was a contract (but not a grant or Cooperative Agreement) DOE, the subcontractor, and the Contractor agree that the mutual obligation of the parties created by this clause constitute a contract between the subcontractor and DOE with respect to those matters covered by this clause; provided, however, that nothing in this paragraph is intended to confer any jurisdiction under the Contracts Disputes Act in connection with proceedings under paragraph (j) of this clause.

(h) Reporting on utilization of subject inventions.

The Contractor agrees to submit on request periodic reports no more frequently than annually on the utilization of a subject invention or on efforts at obtaining such utilization that are being made by the Contractor or its licensees or assignees. Such reports shall include information regarding the status of development, date of first commercial sale or use, gross royalties received by the Contractor, and such other data and information as DOE may reasonably specify. The Contractor also agrees to provide additional reports as may be requested by DOE in connection with any march-in proceeding undertaken by DOE in accordance with paragraph (j) of this clause. As required by 35 U.S.C. 202(c)(5), DOE agrees it will not disclose such information to persons outside the Government without permission of the Contractor.

(i) Preference for United States industry.

Notwithstanding any other provision of this clause, the Contractor agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any subject inventions in the United States unless such person agrees that any products embodying the subject invention or produced through the use of the subject invention will be manufactured substantially in the United States. However, in individual cases, the requirement for such an agreement may be waived by DOE upon a showing by the Contractor or its assignee that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible.

(j) March-in-rights.

The Contractor agrees that with respect to any subject invention in which it has acquired title, DOE has the right in accordance with the procedures in 37 CFR 401.6 and any supplemental

regulations of DOE to require the Contractor, an assignee or exclusive licensee of a subject invention to grant a nonexclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant or applicants, upon terms that are reasonable under the circumstances, and if the Contractor, assignee, or exclusive licensee refuses such a request, DOE has the right to grant such a license itself if DOE determines that:

(1) Such action is necessary because the Contractor or assignee has not taken, or is not expected to take within a reasonable time, effective steps to achieve practical application of the subject invention in such field of use;

(2) Such action is necessary to alleviate health or safety needs which are not reasonably satisfied by the Contractor, assignee, or their licensees;

(3) Such action is necessary to meet requirements for public use specified by Federal regulations and such requirements are not reasonably satisfied by the Contractor, assignee, or licensees; or

(4) Such action is necessary because the agreement by paragraph (i) of this clause has not been obtained or waived or because of licensee of the exclusive right to use or sell any subject invention in the United States is in breach of such agreement.

(k) Special provisions for contracts with nonprofit organizations.

If the Contractor is a nonprofit organization it agrees that:

(1) Rights to a subject invention in the United States may not be assigned without the approval of DOE, except where such assignment is made to an organization which has as one of its primary functions the management of inventions, provided that such assignee will be subject to the same provisions as the Contractors;

(2) The Contractor will share royalties collected on a subject invention with the inventor, including Federal employee coinventors (when DOE deems it appropriate) when the subject invention is assigned in accordance with 35 U.S.C. 202 (e) and 37 CFR 401.10;

(3) The balance of any royalties or income earned by the Contractor with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions, will be utilized for the support of scientific research or education; and

(4) It will make efforts that are reasonable under the circumstances to attract licensees of subject inventions that are small business firms and that it will give a preference to a

small business firm when licensing a subject invention if the Contractor determines that the small business firm has a plan or proposal for marketing the invention which, if executed, is equally as likely to bring the invention to practical application as any plans or proposals from applicants that are not small business firms; provided that the Contractor is also satisfied that the small business firm has the capability and resources to carry out its plan or proposal. The decision whether to give a preference in any specific case will be at the discretion of the Contractor. However, the Contractor agrees that the Secretary of Commerce may review the Contractor's licensing program and decisions regarding small business applicants, and the Contractor will negotiate changes to its licensing policies, procedures, or practices with the Secretary of Commerce when the Secretary of Commerce's review discloses that the Contractor could take reasonable steps to implement more effectively the requirements of this paragraph (k) (4).

(l) Communications. The DOE central point of contact for communications or matters relating to this clause is the Patent Counsel.

8. PATENT RIGHTS (Long Form) (41 CFR § 9-9.107-5(a))

(a) *Definitions*

(1) "Subject Invention" means any invention or discovery of the Participant conceived or first actually reduced to practice in the course of or under this Cooperative Agreement, and includes any art, method, process, machine manufacture, design or composition of matter, or any new and useful improvement thereof, or any variety of plants, whether patented or unpatented under the Patent Laws of the United States of America or any foreign country.

(2) "Contract" means any contract, grant, agreement, understanding, or other arrangement, which includes research, development, or demonstration work, and includes any assignment or substitution of parties.

(3) "States and domestic municipal governments" means the States of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, and any political subdivision and agencies thereof.

(4) "Government agency" includes an executive department, independent commission, board, office, agency, administration, authority, Government corporation, or other Government establishment of the Executive Branch of the Government of the United States of America.

(5) "To the point of practical application" means to manufacture, in the case of a composition or product, to practice in the case of a process, or to operate in the case of a machine and under such conditions as to establish that the invention is being worked and that its benefits are reasonably accessible to the public.

(6) "Patent Counsel" means the Department of Energy Patent Counsel assisting the DOE activity.

(b) Allocation of Principal Rights

(1) Assignment to the Government -- The Participant agrees to assign to the Government the entire right, title, and interest throughout the world in and to each Subject Invention, except to the extent that rights are retained by the Participant under Subparagraph (b)(2) and Paragraph (c) of this clause.

(2) Greater Rights Determinations -- The Participant or the employee-inventor with authorization of the Participant may request greater rights than the nonexclusive license and the foreign patent rights provided in Paragraph (c) of this clause on identified inventions in accordance with 41 CFR 9-9.109-6d. Such requests must be submitted to Patent Counsel (with notification by Patent Counsel to the Contracting Officer) at the time of the first disclosure pursuant to Subparagraph (e)(2) of this clause, or not later than 9 months after conception or first actual reduction to practice, whichever occurs first, or such longer periods as may be authorized by Patent Counsel (with notification by Patent Counsel to the Contracting Officer) for good cause shown in writing by the Participant.

(c) Minimum Rights to the Participant

(1) Participant License -- The Participant reserves a revocable, non-exclusive, paid-up license in each patent application filed in any country on a Subject Invention and any resulting patent in which the Government acquires title. The license shall extend to the Participant's domestic subsidiaries and affiliates, if any, within the corporate structure of which the Participant is a part and shall include the right to grant sublicenses of the same scope to the extent the Participant was legally obligated to do so at the time the contract was awarded. The license shall be transferable only with approval of DOE except when transferred to the successor of that part of the Participant's business to which the invention pertains.

(2) Revocation Limitations -- The Participant's nonexclusive license retained pursuant to Subparagraph (c)(1) of this clause and sublicenses granted thereunder may be revoked or

modified by DOE, either in whole or in part, only to the extent necessary to achieve expeditious practical application of the Subject Invention under DOE's published licensing regulations (10 CFR 781), and only to the extent an exclusive license is actually granted. This license shall not be revoked in that field of use and/or the geographical areas in which the Participant, or its sublicensee, has brought the invention to the point of practical application and continues to make the benefits of the invention reasonably accessible to the public, or is expected to do so within a reasonable time.

(3) Revocation Procedures -- Before modification or revocation of the license or sublicense, pursuant to Subparagraph (c)(2) of this clause, DOE shall furnish the Participant a written notice of its intention to modify or revoke the license and any sublicense thereunder, and the Participant shall be allowed 30 days, or such longer period as may be authorized by the Patent Counsel (with notification by Patent Counsel to the Contracting Officer), for good cause shown in writing by the Participant, after such notice to show cause why the license or any sublicense should not be modified or revoked. The Participant shall have the right to appeal, in accordance with 10 CFR 781, any decision concerning the modification or revocation of its license or any sublicense.

(4) Foreign Patent Rights -- Upon written request to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) and subject to DOE security regulations and requirements, there shall be reserved to the Participant, or the employee-inventor with authorization of the Participant, the patent rights to a Subject Invention in any foreign country where the Government has elected not to secure such rights provided:

(i) The recipient of such rights, when specifically requested by DOE and 3 years after issuance of a foreign patent disclosing said Subject Invention, shall furnish DOE a report setting forth:

(A) The commercial use that is being made, or is intended to be made, of said invention, and

(B) The steps taken to bring the invention to the point of practical application or to make the invention available for licensing.

(ii) The Government shall retain at least an irrevocable, nonexclusive, paid-up license to make, use, and sell the invention throughout the world by or on behalf of the Government (including any Government agency) and States and domestic municipal governments unless the

Secretary or his designee determines that it would not be in the public interest to acquire the license for the State and domestic municipal governments.

(iii) Subject to the rights granted in Subparagraphs (c)(1), (2), and (3) of this clause, the Secretary or his designee shall have the right to terminate the foreign patent rights granted in this Subparagraph (c)(4) in whole or in part unless the recipient of such rights demonstrates to the satisfaction of the Secretary or his designee that effective steps necessary to accomplish substantial utilization of the invention have been taken or within a reasonable time will be taken.

(iv) Subject to the rights granted in Subparagraphs (c)(1), (2), and (3) of this article, the Secretary or his designee shall have the right, commencing 4 years after foreign patent rights are accorded under this Subparagraph (c)(4), to require the granting of a nonexclusive or partially exclusive license to a responsible applicant or applicants, upon terms reasonable under the circumstances, and in appropriate circumstances to terminate said foreign patent rights in whole or in part, following a hearing upon notice thereof to the public, upon a petition by an interested person justifying such hearing:

(A) If the Secretary or his designee determines, upon review of such material as he deems relevant, and after the recipient of such rights or other interested person has had the opportunity to provide such relevant and material information as the Secretary or his designee may require that such foreign patent rights have tended substantially to lessen competition, or to result in undue market concentration in any section of the United States in any line of commerce to which the technology relates; or

(B) Unless the recipient of such rights demonstrates to the satisfaction of the Secretary or his designee at such hearing that the recipient has taken effective steps or within a reasonable time thereafter is expected to take such steps, necessary to accomplish substantial utilization of the invention.

(d) Filing of Patent Applications

(1) With respect to each Subject Invention in which the Participant or the inventor requests foreign patent rights in accordance with Subparagraph (c)(4) of this clause, a

request may also be made for the right to file and prosecute the U.S. application on behalf of the U.S. Government. If such request is granted, the Participant or inventor shall file a domestic patent application on the invention within 6 months after the request for foreign patent rights is granted, or such longer period of time as may be approved by Patent Counsel for good cause shown in writing by the requestor. With respect to the invention, the requestor shall promptly notify the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) of any decision not to file an application.

(2) For each Subject Invention on which a domestic patent application is filed by the Participant or inventor, the Participant or inventor shall:

(i) Within 2 months after the filing of a patent application or within 2 months after submission of the invention disclosure if the patent application has been filed previously, deliver to the Patent Counsel a copy of the application as filed including the filing date and serial number;

(ii) Within 6 months after filing the application or within 6 months after submitting the invention disclosure if the application has been filed previously, deliver to the Patent Counsel a duly executed and approved assignment to the Government, on a form specified by the Government;

(iii) Provide the Patent Counsel with the original patent grant promptly after a patent is issued on the application; and

(iv) Not less than 30 days before the expiration of the response period for any action required by the Patent and Trademark Office, notify the Patent Counsel of any decision not to continue prosecution of the application.

(3) With respect to each Subject Invention in which the Participant or inventor has requested foreign patent rights, the Participant or inventor shall file a patent application on the invention in each foreign country in which such request is granted in accordance with applicable statutes and regulations and within one of the following periods:

(i) Eight months from the date of filing a corresponding United States application, or if such an application is not filed, 6 months from the date the request was granted;

(ii) Six months from the date a license is granted by the Commissioner of Patents and Trademarks to file the

foreign patent application where such filing has been prohibited by security reasons; or

(iii) Such longer periods as may be approved by the Patent Counsel for good cause shown in writing by the Participant or inventor.

(4) Subject to the license specified in Subparagraphs (c)(1), (2), and (3) of this clause, the Participant or inventor agrees to convey to the Government upon request the entire right, title, and interest in any foreign country in which the Participant or inventor fails to have a patent application filed in accordance with Subparagraph (d)(3) of this clause, or decides not to continue prosecution or to pay any maintenance fees covering the invention. To avoid forfeiture of the patent application or patent, the Participant or inventor shall, not less than 60 days before the expiration period for any action required by any Patent Office, notify the Patent Counsel of such failure or decision, and deliver to the Patent Counsel the executed instruments necessary for the conveyance specified in this paragraph.

(e) Invention Identification, Disclosures, and Reports

(1) The Participant shall establish and maintain active and effective procedures to ensure that Subject Inventions are promptly identified and timely disclosed. These procedures shall include the maintenance of laboratory notebooks or equivalent records and any other records that are reasonably necessary to document the conception and/or the first actual reduction to practice of Subject Inventions, and records which show that the procedures for identifying and disclosing the inventions are followed. Upon request the Participant shall furnish the Contracting Officer a description of these procedures so that he may evaluate and determine their effectiveness.

(2) The Participant shall furnish the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) on a DOE-approved form:

(i) A written report containing full and complete technical information concerning each Subject Invention within 6 months after conception or first actual reduction to practice whichever occurs first in the course of or under this Cooperative Agreement but in any event prior to any sale, public use, or public disclosure of such invention known to the Participant. The report shall identify the contract and inventor and shall be sufficiently complete in technical detail and appropriately illustrated by sketch or diagram to convey to one skilled in the art to which the invention pertains a clear understanding of the

nature, purpose, operation, and to the extent known the physical, chemical, biological, or electrical characteristics of the invention. The report should also include any request for foreign patent rights under Subparagraph (c)(4) of this clause and any request to file a domestic patent application under (d)(1) of this clause. However, such request shall be made within the period set forth in Subparagraph (b)(2) of this clause. When an invention is reported under this Subparagraph (e)(2)(i), it shall be presumed to have been conceived or first actually reduced to practice in the course of or under the contract, unless the Participant contends it was not so made, in accordance with Subparagraph (g)(2)(ii) of this clause.

(ii) Upon request, but not more than annually, interim reports on a DOE-approved form listing Subject Inventions and subcontracts awarded containing a Patent Rights clause for that period and certifying that:

(A) The Participant's procedures for identifying and disclosing Subject Inventions as required by this Paragraph (e) have been followed throughout the reporting period;

(B) All Subject Inventions have been disclosed or that there are no such inventions; and

(C) All subcontracts containing a Patent Rights clause have been reported or that no such subcontracts have been awarded; and

(iii) A final report on a DOE-approved form within 3 months after completion of the contract work listing all Subject Inventions and all subcontracts awarded containing a Patent Rights clause and certifying that:

(A) All Subject Inventions have been disclosed or that there were no such inventions; and

(B) All subcontracts containing a Patent Rights clause have been reported or that no such subcontracts have been awarded.

(3) The Participant shall obtain patent agreements to effectuate the provisions of this clause from all persons in its employ who perform any part of the work under the Cooperative Agreement except nontechnical personnel, such as clerical employees and manual laborers.

(4) The Participant agrees that the Government may duplicate and disclose Subject Invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this clause. If the Participant is to file a foreign patent application on a Subject Invention, the Government agrees, upon written request, to use its best efforts to withhold public disclosure of such invention disclosures until the expiration of the time period specified in Subparagraph (d)(1) of this clause, but in no event shall the Government or its employees be liable for any publication thereof.

(f) Publication

It is recognized that during the course of the work under this Cooperative Agreement, the Participant or its employees may from time to time desire to release or publish information regarding scientific or technical developments conceived or first actually reduced to practice in the course of or under this Cooperative Agreement. In order that public disclosure of such information will not adversely affect the patent interests of DOE or the Participant, patent approval for release or publication shall be secured from Patent Counsel prior to any such release or publication.

(g) Forfeiture of Rights in Unreported Subject Inventions

(1) The Participant shall forfeit to the Government, at the request of the Secretary or his designee, all rights in any Subject Invention which the Participant fails to report to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) within 6 months after the time the Participant:

(i) Files or causes to be filed a United States or foreign patent application thereon; or

(ii) Submits the final report required by Subparagraph (e)(2)(iii) of this clause, whichever is later.

(2) However, the Participant shall not forfeit rights in a Subject Invention if, within the time specified in (1)(i) or (1)(ii) of this Paragraph (g), the Participant:

(i) Prepares a written decision based upon a review of the record that the invention was neither conceived nor first actually reduced to practice in the course of or under the Cooperative Agreement and delivers the same to Patent Counsel (with notification by Patent Counsel to the Contracting Officer); or

(ii) Contending that the invention is not a Subject Invention, the Participant nevertheless discloses the

invention and all facts pertinent to this contention to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer); or

(iii) Establishes that the failure to disclose did not result from the Participant's fault or negligence.

(3) Pending written assignment of the patent application and patents on a Subject Invention determined by the Secretary or his designee to be forfeited (such determination to be a final decision under the Disputes clause of this Cooperative Agreement), the Participant shall be deemed to hold the invention and the patent applications and patents pertaining thereto in trust for the Government. The forfeiture provision of this Paragraph (g) shall be in addition to and shall not supersede other rights and remedies which the Government may have with respect to Subject Inventions.

(h) Examination of Records Relating to Inventions

(1) The Contracting Officer or his authorized representative, until the expiration of 3 years after final payment under this Cooperative Agreement, shall have the right to examine any books (including laboratory notebooks), records, documents, and other supporting data of the Participant which the Contracting Officer or his authorized representative reasonably deems pertinent to the discovery or identification of Subject Inventions or to determine compliance with the requirements of this clause.

(2) The Contracting Officer or his authorized representative shall have the right to examine all books (including laboratory notebooks), records, and documents of the Participant relating to the conception or first actual reduction to practice of inventions in the same field of technology as the work under this Cooperative Agreement to determine whether any such inventions are Subject Inventions, if the Participant refuses or fails to:

(i) Establish the procedures of Subparagraph (e)(1) of this clause; or

(ii) Maintain and follow such procedures; or

(iii) Correct or eliminate any material deficiency in the procedures within 30 days after the Contracting Officer notifies the Participant of such a deficiency.

(i) Withholding of Payment (Not Applicable to Subcontracts)

(1) Any time before final payment of the amount of this Cooperative Agreement, the Contracting Officer may, if he deems

such action warranted, withhold payment until a reserve not exceeding $50,000 or 5 percent of the amount of this Cooperative Agreement, whichever is less, shall have been set aside if in his opinion the Participant fails to:

(i) Establish, maintain, and follow effective procedures for identifying and disclosing Subject Inventions pursuant to Subparagraph (e)(1) of this clause; or

(ii) Disclose any Subject Invention pursuant to Subparagraph (e)(2)(i) of this clause; or

(iii) Deliver the interim reports pursuant to Subparagraph (e)(2)(ii) of this clause; or

(iv) Provide the information regarding subcontracts pursuant to Subparagraph (j)(5) of this clause; or

(v) Convey to the Government, using a DOE-approved form, the title and/or rights of the Government in each Subject Invention as required by this clause.

(2) The reserve or balance shall be withheld until the Contracting Officer has determined that the Participant has rectified whatever deficiencies exist and has delivered all reports, disclosures, and other information required by this clause.

(3) Final payment under this Cooperative Agreement shall not be made by the Contracting Officer before the Participant delivers to Patent Counsel all disclosures of Subject Inventions and other information required by Subparagraph (e)(2)(i) of this clause, the final report required by Subparagraph (e)(2)(iii) of this clause, and Patent Counsel has issued a patent clearance certification to the Contracting Officer.

(4) The Contracting Officer may, in his discretion, decrease or increase the sums withheld up to the maximum authorized above. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the Cooperative Agreement. The withholding of any amount or subsequent payment thereof shall not be construed as a waiver of any rights accruing to the Government under this contract.

(j) Subcontracts

(1) The Participant will include the attached clause (Patent Rights -- Small Business Firms or Nonprofit Organizations -- suitably modified to identify the parties, in all subcontracts, regardless of tier, for experimental, developmental, or research work to be performed in the United States by a small business firm or a nonprofit organization. In all other subcontracts, regardless of tier for experimental, developmental, demonstration, or research work, the

Participant will include a Patent Rights clause as approved by the Contracting Officer.

(2) Except as may be otherwise provided in this clause, the Participant shall not, in any subcontract by using a subcontract as consideration therefor, acquire any rights in its subcontractor's subject invention for the Participant's own use (as distinguished from such rights as may be required solely to fulfill the Participant's contract obligations to the Government in the performance of this contract).

(3) All invention disclosures, reports, instruments, and other information required to be furnished by the subcontractor to DOE, under the provisions of a Patent Rights clause in any subcontract hereunder may, in the discretion of the Contracting Officer, be furnished to the Participant for transmission to DOE.

(4) The Participant shall promptly notify the Contracting Officer in writing upon the award of any subcontract containing a Patent Rights clause by identifying the subcontractor, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon the request of the Contracting Officer, the Participant shall furnish a copy of the subcontract.

(5) The Participant shall identify all subject inventions of the subcontractor of which it acquires knowledge in the performance of this Cooperative Agreement and shall notify the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) promptly upon the identification of the inventions.

(6) It is understood that the Government is a third party beneficiary of any subcontract clause granting rights to the Government in subject inventions, and the Participant hereby assigns to the Government all rights that the Participant would have to enforce the subcontractor's obligations for the benefit of the Government with respect to subject inventions. The Participant shall not be obligated to enforce the agreements of any subcontractor hereunder relating to the obligations of the subcontractor to the Government regarding subject inventions.

(k) Background Patents

(1) "Background Patent" means a domestic patent covering an invention or discovery which is not a subject invention and which is owned or controlled by the Participant at any time through the completion of this Cooperative Agreement:
   (i) Which the Participant, but not the Government, has the right to license to others without obligation to pay royalties thereon, and

(ii) Infringement of which cannot reasonably be avoided upon the practice of any specific process, method, machine, manufacture, or composition of matter (including relatively minor modifications thereof) which is a subject of the research, development, or demonstration work performed under this contract.

(2) The Participant agrees to and does hereby grant to the Government a royalty-free, nonexclusive license under any Background Patent for purposes of practicing a subject of this contract by or for the Government in research, development, and demonstration work only.

(3) The Participant also agrees that upon written application by DOE it will grant to responsible parties, for purposes of practicing a subject of this contract, nonexclusive licenses under any Background Patent on terms that are reasonable under the circumstances. If, however, the participant believes that exclusive or partially exclusive rights are necessary to achieve expeditious commercial development or utilization, then a request may be made to DOE for DOE approval of such licensing by the Participant.

(4) Notwithstanding the foregoing paragraph (k)(3), the contractor shall not be obligated to license any background patent if the contractor demonstrates to the satisfaction of the Head of the Agency or designee that the contractor or its licensees are supplying the subject matter covered by said background patent in sufficient quantity and at reasonable prices to satisfy market needs, or have taken effective steps to so supply the subject matter.

(l) (Reserved)

(m) Limitation of Rights

Nothing contained in this Patent Rights article shall be deemed to give the Government any rights with respect to any invention other than a Subject Invention except as set forth in the Patent Rights clause of this Cooperative Agreement with respect to Background Patents and the Facilities License.

(n) Facility Patent License

The Contractor agrees to and does hereby grant to the Government or others acting on its behalf, an irrevocable non-exclusive paid-up license in and to any invention of discovery of the Contractor which is incorporated or embodied in the design or construction or utilized in the operation of the Facility or which covers articles, materials or products manufactured at the Facility (1) to practice or have practiced by or for the Government at the Facility, and (2) to transfer such license with the transfer of

that Facility. Further, the Contractor agrees to obtain an equivalent license from its subcontractors and licensors, if any.

9. RIGHTS IN TECHNICAL DATA (long Form) (48 CFR § 952.227-75)

(a) Definitions.

(1) "Technical data" means recorded information, regardless of form or characteristic, of a scientific or technical nature. It may, for example, document research, experimental, developmental, or demonstration, or engineering work, or be usable or used to define a design or process, or to procure, produce, support, maintain, or operate material. The data may be graphic or pictorial delineations in media such as drawings or photographs, text in specifications or related performance or design type documents or computer software (including computer programs, computer software data bases, and computer software documentation).

Examples of technical data include research and engineering data, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical

reports, catalog item identification, and related information. Technical data as used herein do not include financial reports, cost analyses, and other information incidental to Cooperative Agreement administration.

(2) "Proprietary data" means technical data which embody trade secrets developed at private expense, such as design procedures or techniques, chemical composition of materials, or manufacturing methods, processes, or treatments, including minor modifications thereof, provided that such data:

(i) Have not been made available by the owner to others without obligation concerning its confidentiality; and

(iii) Are not already available to the Government without obligation concerning their confidentiality.

(3) "Contract data" means technical data first produced in the performance of this Cooperative Agreement, technical data which are specified to be delivered under this Cooperative Agreement, technical data that may be called for under the Additional Technical Data Requirements clause of this Cooperative Agreement, if any, or technical data actually delivered in connection with this Cooperative Agreement.

(4) "Unlimited rights" means rights to use, duplicate, or disclose technical data, in whole or in part, in any manner and for any purpose whatsoever, and to permit others to do so.

(5) "Government" means the Government of the United States of America.

(6) "Cooperative Agreement" means this Cooperative Agreement _____ between _____ and the Department of Energy.

(7) "Know-how" means unpatented technical information, assistance, training or expertise including drawings, designs, specifications, blueprints, or manuals owned or controlled by the Participant.

(8) "Facility" means the ____ facility that is to be designed, constructed, and operated as part of this Cooperative Agreement.

(9) "Participant" means _____, signatory to this Cooperative Agreement.

(b) Allocation of rights.

(1) The Government shall have:

(i) Unlimited rights in contract data except as otherwise provided below with respect to proprietary data;

(ii) The right to remove, cancel, correct, or ignore any marking not authorized by the terms of this Cooperative Agreement on any technical data furnished hereunder, if in response to a written inquiry by DOE concerning the propriety of the markings, the Participant fails to respond thereto within 60 days or fails to substantiate the propriety of the markings. In either case, DOE will notify the Participant of the action taken;

(iii) No rights under this Cooperative Agreement in any technical data which are not Contract Data.

(2) The Participant shall have:

(i) The right to withhold proprietary data in accordance with the provisions of this clause; and

(ii) The right to use for its private purposes, subject to patent, security, or other provisions of this Cooperative Agreement, Contract Data it first produces in the performance of this Cooperative Agreement, provided the data requirements of this Cooperative Agreement have been met as of the date of the private use of such data. The Participant agrees that to the extent it receives or is given access to proprietary data or other technical, business, or financial data in the

form of recorded information from DOE or a DOE Contractor or subcontractor, the Participant shall treat such data in accordance with any restrictive legend contained thereon unless use is specifically authorized by prior written approval of the Contracting Officer.

(3) Nothing contained in this Rights of Technical Data clause shall imply a license to the Government under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government under any Patent.

(c) Copyrighted material.

(1) The Participant shall not, without prior written authorization of the Patent Counsel, establish a claim to statutory copywrite in any contract data first produced in the performance of this Cooperative Agreement. To the extent such authorization is granted, the Government reserves for itself and others acting on its behalf a royalty-free, nonexclusive, irrevocable, worldwide license for Governmental purposes to publish, distribute, translate, duplicate, exhibit, and perform any such data copyrighted by the Participant.

(2) The Participant agrees not to include in the technical data delivered under this Cooperative Agreement any material copyrighted by the Participant and not to knowingly include any material copyrighted by others, without first granting or obtaining at no cost a license therein for the benefit of the Government of the same scope as set forth in Paragraph (c)(1) above. If such royalty-free license is unavailable and the Participant nevertheless determines that such copyrighted material must be included in the technical data to be delivered, rather than merely incorporated therein by reference, the Participant shall obtain the written authorization of the Contracting Officer to include such copyrighted material in the technical data prior to its delivery.

(3) The Participant agrees that upon written application by the DOE it will grant to the extent practicable a non-exclusive license to responsible third parties in any copyrighted work that is utilized, tested or embodied by the Participant in the performance of work under this Cooperative Agreement or subcontract to practice the _____ system which is the subject of this Cooperative Agreement on terms and conditions which are reasonable under the circumstances.

(d) Subcontracting. It is the responsibility of the Participant to obtain from its contractors and subcontractors technical data and rights therein, on behalf of the Government, necessary to fulfill

the Participant's obligations to the Government with respect to such data. In the event of refusal by a subcontractor to accept a clause affording the Government such rights, the Participant shall:

(1) Promptly submit written notice to the Contracting Officer of the Cooperative Agreement setting forth reasons for the subcontractor refusal and other pertinent information which may expedite disposition of the matter; and

(2) Not proceed with the subcontract without the written authorization of the Contracting Officer.

(3) As used in this Rights in Technical Data clause, the term Contractor or Subcontractor includes any person or entity responsible for fulfilling the Participant's obligations to the Government with respect to technical data.

(e) Withholding of proprietary data. Notwithstanding the inclusion of the additional Technical Data Requirements Clause in this Cooperative Agreement or any provision of this Cooperative Agreement specifying the delivery of technical data, the Participant may withhold proprietary data from delivery, provided that the Participant furnishes in lieu of any such proprietary data so withheld technical data disclosing the source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements ("Form, Fit, and Function" data, e.g., specification control drawings, catalog sheets, envelope drawings, etc., or a general description of such proprietary data where "Form, Fit, and Function" data are not applicable). The Government shall acquire no rights to any proprietary data so withheld except that such data shall be subject

to the "Inspection rights" provisions of Paragraph (f), the "Limited rights in proprietary data" provisions of Paragraph (g), and, if included, the "Participant licensing" provisions of Paragraph (h), the "Availability of contract and other data" provisions of Paragraph (i), the "Commercialization of _____ technology" provisions of Paragraph (j).

(f) Inspection rights. Except as may be otherwise specified in this Cooperative Agreement for specific items of proprietary data, which are not subject to this paragraph, the Contracting Officer's representatives, at all reasonable times up to 3 years after final payment under this Cooperative Agreement, may inspect at the participants facility any proprietary data withheld under Paragraph (e) for the purpose of verifying that such data properly fell within the withholding provisions of Paragraph (e) or for evaluating work performance.

(g) Limited rights in proprietary data. Except as may be otherwise specified in this Cooperative Agreement as technical data which are not subject to this paragraph, the Participant shall, upon written request from the Contracting Officer at any time prior to

3 years after final payment under this Cooperative Agreement, promptly deliver to the Government any "proprietary data" withheld pursuant to Paragraph (e) of the Rights in Technical Data clause of this Cooperative Agreement. The following legend and no other is authorized to be affixed on any "proprietary data" delivered pursuant to this provision, provided the "proprietary data" meets the conditions for initial withholding under Paragraph (e) of the Rights in Technical Data clause. The Government will thereafter treat the "proprietary data" in accordance with such legend.

LIMITED RIGHTS LEGEND

This "proprietary data" furnished under Cooperative Agreement _____ with the United States Department of Energy may be duplicated and used by the Government with the express limitations that the "proprietary data" may not be disclosed outside the Government or be used for purposes of manufacture without prior permission of the Participant, except that further disclosure or use may be made solely for the following purposes:

(1) This "proprietary data" may be disclosed for evaluation purposes under the restriction that the "proprietary data" be retained in confidence and not be further disclosed;

(2) This "proprietary data" may be disclosed to other contractors participating in the Government's program of which this Cooperative Agr ee-ment is a part, for information or use in connection with the work performed under these contracts and under the restriction that the "proprietary data" be retained in confidence and not be further disclosed; or

(3) This "proprietary data" may be used by the Government or others on its behalf for emergency repair or overhaul work at the Facility under the restriction that the "proprietary data" be retained in confidence and not be further disclosed.

This legend shall be marked on any reproduction of this data in whole or in part.

(h) Contract licensing. Except as may be otherwise specified in this contract as technical data not subject to this paragraph, the con-

tractor agrees that upon written application by DOE, it will grant to the Government and responsible third parties, for purpose of practicing a subject of this contract, a nonexclusive license in any contract data which are proprietary data, on terms and conditions reasonable under the circumstances including appropriate provisions for confidentiality; provided, however, the contractor shall not be obligated to license any such data if the contractor demonstrates to the satisfaction of the Head of the Agency or designee that:

(1) Such data are not essential to the manufacture or practice of hardware designed or fabricated, or processes developed, under this contract;

(2) Such data, in the form of results obtained by their use, are being supplied by the contractor or its licensees in sufficient quantity and at reasonable prices to satisfy market needs, or the contractor or its licensees have taken effective steps or within a reasonable time are expected to take effective steps to so supply such data in the form of results obtained by their use; or

(i) Availability of contract and other data.

(1) The Participant will, for the entire period of Participant's participation in the project at the Facility (including operation of the Facility) and for three years thereafter, whether or not under a Government Cooperative Agreement, keep and maintain all technical data, including proprietary data and data obtained from subcontractors and licensors, necessary to construct and/or operate the Facility, and all data including business and financial data necessary to evaluate the technical and economic operation of the Facility. During the entire period of construction and/or operation of the Facility, regardless of whether the Government participates past Phase I, the Participant shall permit the Government and its representative the right to inspect at the Facility any data kept and maintained

pursuant to this paragraph. The Participant shall, after termination of the Government's participation in the project at the facility, periodically deliver reports to the Government on the construction and operation of the facility, which reports shall not include proprietary data.

(2) If the Participant withdraws from this Cooperative Agreement or defaults after Phases IA, IB, or II, the Government shall have the right to have all data kept and maintained pursuant to Paragraph (1) above, delivered to the Government or otherwise disposed of as the Contracting Officer shall direct upon such termination. Any proprietary data

delivered pursuant to this paragraph shall be marked as provided in Paragraph (g) above with the addition to the legend thereof as follows: (4) This "proprietary data" may be used by Government or others on its behalf in confidence to the extent necessary to enable the Government to complete Phases II and/or III.

(3) The Participant agrees to and does hereby grant to the Government or others acting on its behalf, an irrevocable non-exclusive paid-up license in and to any proprietary data of the Participant which are incorporated or embodied in the design or construction or utilized in the operation of the Facility: (1) to practice, or to have practiced, by or for the Government at the Facility, and (2) to transfer such license with the transfer of that Facility. Further, the Participant agrees to obtain an equivalent license from its contractors, subcontractors, and licensors, if any. The license granted pursuant to this subparagraph shall be for the limited purpose of completion, repair or operation of the demonstration facility.

(j) Commercialization of _____ Technology.

(1) In addition to or in assistance of any rights acquired by the Government in _____ Technology from the Participant under paragraph (k) of the Patents Clause and paragraph (h) of the Rights in Technical Data Clause, the Participant agrees to negotiate in good faith with a responsible applicant and to conclude an agreement with such applicant to provide a commercial-size facility incorporating _____ Technology in the United States equal to or a scaled-up or modified version of the _____ facility which is a subject of this Cooperative Agreement. The Agreement shall, as appropriate to the circumstances, include provisions for licensing patented and unpatented _____ Technology including background patents, waived subject inventions, proprietary data, know-how and copyrighted works including improvements or enhancements of any of the foregoing as well as provisions for technical assistance and training.

(2) The services and/or licenses specified in (j)(1) of this paragraph shall be made available to responsible applicants to construct or have constructed, operate or have operated a facility incorporating _____ Technology in the United States under reasonable terms and conditions taking into consideration accepted licensing standards or norms in the relevant U.S. industry as well as accepted levels of return on investment for such activities and/or services.

(3) In the event that the Participant and the applicant cannot reach agreement after one year from the start of diligent and responsible negotiations between them, then the DOE by its Secretary or designee, reserves the option to submit,

with the approval of the said applicant, unresolved licensing issues to arbitration in New York under the rules of the American Arbitration Association. The Participant agrees to be bound by the results of the Arbitration.

(4) The provisions of subparagraphs (1), (2), and (3) of this paragraph (j) shall not apply as long as the Participant or its licensees are supplying U.S. market needs at reasonable prices for _____ systems.

(5) The Participant agrees to obtain sufficient rights to meet its commitments to commercialize and/or license _____ Technology.

ATTACHMENT C

FEDERAL ASSISTANCE REPORTING CHECKLIST

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10/80)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number:	2. Program/Project Title:
3. Recipient:	

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
[X] Federal Assistance Milestone Plan	O, Q	1, 3	A, B
[X] Federal Assistance Budget Information Form	O, X	1, 3	A, B
[X] Federal Assistance Management Summary Report	O, Q	1, 4	A, B
[X] Federal Assistance Program/Project Status Report	M	1, 3	A, B
[X] Financial Status Report, OMB Form 269	M	1, 3	A, B
TECHNICAL INFORMATION REPORTING			
[ ] Notice of Energy RD&D			
[X] Technical Progress Report	Q	1, 4	A, B
[X] Topical Report	A	1, 4	A, B
[X] Final Technical Report	F	1, 5	A, B

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
F - Final; 90 calendar days after the performance of the effort ends.
Q - Quarterly; within 30 days after end of calendar quarter or portion thereof.
O - One time after project starts; within 30 days after award.
X - Required with proposals or with the application or with significant planning changes.
Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

The Special Instructions are attached to this checklist.

In addition to the reports identified above, the deliverables identified in Sections 6.0 and 7.0 of the Special Instructions are required.

6. Prepared by: (Signature and Date)	7. Reviewed by: (Signature and Date)

FEDERAL ASSISTANCE REPORTING CHECKLIST

PURPOSE

This form serves to identify plans and reports selected by DOE as reporting requirements for the Federal Assistance Program/Project.

INSTRUCTIONS

Item 1 — Enter the program /project identification number as it appears in the official award.

Item 2 — Enter the program/project description as it appears in the official award.

Item 3 — Enter the name of the recipient.

Item 4 — Check spaces to indicate plans and reports selected. For each report checked, indicate frequency of delivery in column provided using one of the frequency of delivery codes as shown, as well as the number of copies requested and to whom they should be sent.

Federal Assistance Milestone Plan — presents, with the accompanying Milestone Log, a schedule of the planned activity.

Federal Assistance Budget Information Form — presents the planned costs,

Federal Assistance Management Summary Report — registers planned progress and costs to actual progress and costs in a capsulized format.

Federal Assistance Program/Project Status Report — periodically reports project status, explains variances and problems, and discusses any other areas of concern or achievements.

Financial Status Report, OMB Form 269 — presents the status of funds committed to the project.

Notice of energy R&D Project — provides information on unclassified DOE R&D Project for dissemination to the scientific, technical, and industrial communities and to the public. Also provides information to the Smithsonian Information Exchange and to the DOE Technical Information Center.

Technical Progress Report — periodically reports progress and/or results of DOE supported R&D and scientific projects covering a specific reporting period.

Topical Report — presents the technical results of work performed on a specific phase of a project.

Final Technical Report — presents a technical accounting of the total work performed on a project.

Frequency Codes - Each code represents a specific reporting frequency (such as Quarterly). These time periods are suggested in the program announcement and negotiated at the time of the award.

Item 5 — Identify any special reporting requirements or instructions not identified in Item 4. (Use additional sheets as necessary.).

Item 6 — Signature of person preparing the checklist and the date prepared. Preparation is by person responsible for program solicitation.

Item 7 — Signature of the person reviewing the checklist and date reviewed.

The Participant shall prepare and submit (postage prepaid) the plans and reports indicated in this Attachment. The Participant shall be responsible for levying appropriate reporting requirements on any contractor or subcontractor in such a manner as to ensure that data submitted by the contractor or subcontractor to the Participant is compatible with the data elements that the Participant is responsible for submitting to DOE.

[The Government requires timely reporting of technical, cost, and schedule status during project performance, as well as documentation of the technical, economic, and environmental performance data that result from the project. It is the intention, whenever possible, to utilize the Participant's project status reporting system to the extent it provides the information identified in this Attachment. The requirement for the reports listed, their contents, and their frequency of submission are to be negotiated, but must be commensurate with the scope and complexity of the proposed project. Attachment C of this Model Cooperative Agreement presents the anticipated reporting effort for a typical project. If the Participant's project control and reporting system cannot satisfy the Government's requirements, then the appropriate forms embodied in the Uniform Reporting System for Federal Assistance (Grants and Cooperative Agreements) will be incorporated into the Cooperative Agreement.]

DISTRIBUTION

Note: DOE will provide the addresses to which the reports specified in the this attachment will be sent.

Example:

A. Contracting Officer's Technical Representative
Energy Technology Center
City, State

B. Reports Receipt Coordinator
Energy Technology Center
City, State

C. U.S. Department of Energy
Office of Patent Counsel
City, State

SPECIAL INSTRUCTIONS
FINANCIAL ASSISTANCE REPORTING REQUIREMENTS CHECKLIST

1.0 Project Management Reporting

Project management reporting shall be by Work Breakdown Structure (WBS) or a suitable alternative to logically and systematically define project activities for the tracking of technical, cost and schedule progress. If a WBS system is used, then the structure should be as follows:

Level 1 -- Project
Level 2 -- Phase (i.e., design, construction, operation)
Level 3 -- Tasks (as defined in the Statement of Work)

If an alternate system is used, then the reporting should be detailed at least to a level comparable to WBS Level 3.

2.0 Baseline Plans

Discrete, measurable units of the proposed work are to be presented in the Baseline Plans. These plans will provide a specific outline of what the Participant intends to do, how it is intended to be accomplished, and the time and cost involved. These plans will be developed and submitted to serve as the standard against which status and progress can be measured during the performance period. The following descriptions of baseline planning forms normally used by DOE for financial assistance agreements define the type and detail of information required.

2.1 Federal Assistance Management Summary Report (Form EIA-459E).

This report is a single page form which is used to present projected cost and activity data. The cost data to be entered must depict projected total costs for the life of the project on at least a quarterly basis. The activity data required are a delineation of the project's major milestones and a bar chart displaying the projected schedule for attainment of these milestones. This form may be used for both the baseline plan and for project status reporting.

2.2 Federal Assistance Milestone Plan (Form EIA-459B).

The milestone plan is used to portray the major milestones of the project in bar chart format. The purpose of the plan is to establish the Participant's time schedule for accomplishing planned events and milestones. It covers the life of the project and is to be organized by major project activities. It should be detailed to a level equivalent to WBS Level 3. Intermediate events and critical milestones are further identified in an attached "milestone log" and include the identification number, descriptive name of the event or milestone, and the scheduled date of completion.

2.3 Federal Assistance Budget Information Form (Form EIA-459C).

This form is used to provide summary level data on the proposed total project budget. The total project budget is broken down into Federal and non-Federal funds for each major activity and shall include a separate breakdown of the total budget for each WBS Level 3 (or equivalent) activity by object class of expenditure (i.e., personnel, travel, etc.).

3.0 Status Reports

Status Reports shall provide the performance information required to determine program effectiveness and the information which DOE requires to maintain accountability for public funds. The reports must show actual costs, schedule progress, and total project status to date. When the status reports are compared with the baseline plans, accomplishments can be noted, problems become apparent, and corrective action can be taken. The following descriptions of status report forms normally used by DOE for financial assistance agreements define the type and detail of information required.

3.1 Federal Assistance Management Summary Report (Form EIA-459E).

This report is a single page form on which the Participant provides summary cumulative cost and activity data for each reporting period.

3.2 Federal Assistance Program/Project Status Report (Form EIA-459F).

This report is a single page form on which the Participant enters brief narrative discussion of the following topics: approach changes; performance and cost variances from baseline; accomplishments and problems; open milestones; and a status assessment and forecast.

3.3 Financial Status Report (Standard Form 269).

This form is used to provide DOE with regular periodic accounting of project funds expended. The accounting may be on either a cash or accrual basis. Actual total expenditures and obligations incurred, but not paid, are reported for each reporting period for each major activity. They should correlate with those WBS Level 3 (or equivalent) activities identified on the "Federal Assistance Milestone Plan." Provision must be made to identify the Federal and non-Federal share of project outlays for each identified activity. This report must also include an updated estimate of total anticipated costs for the subsequent reporting period and for completion of the project.

4.0 Submission of Reports and Other Documents for DOE Review

The Participant shall submit to DOE for review and approval all deliverables defined in Sections 5.0, 6.0 and 7.0 of this Attachment

unless specifically exempted. This review and approval shall occur prior to any submission for publication, announcement, or presentation.

Unless otherwise stated, all such scientific and technical report deliverables required by the Cooperative Agreement will be submitted in draft form. DOE will review the draft and provide comments within 30 days of receipt from the Participant. The Participant will incorporate those comments mutually agreed to and will submit the report in final form within 30 days after receipt of DOE's comments.

All documents intended for publication, announcement, or presentation require prior clearance by DOE Patent Counsel. However, journal articles, conference papers and proceedings, etc., usually must be cleared by Patent Counsel in a relatively short period of time. Therefore, the Participant shall make direct distribution to the COTR and to DOE Patent Counsel.

All final copies of documents designated by the COTR for publication and/or announcement shall be prepared in accordance with the instructions entitled "Guidelines for Preparation of Reproducible Master (Camera-Ready) Copy of Reports" which will be furnished at a later date.

The Participant should recognize that full and comprehensive compliance of its reporting requirements under this Cooperative Agreement may involve disclosure of proprietary data to the Government for the exercise of the Government's rights in accordance with the Rights in Technical Data clause. Recognizing that the Government intends to publish, in whole, certain required reports and other information about the project which is the subject of this Cooperative Agreement while preserving the proprietary data of the Participant, the Participant shall submit all deliverables as stand-alone documents which do not contain proprietary data. Whenever, in any deliverable, proprietary data are needed for fullness of reporting, they shall be included in a proprietary appendix.

It is the intention of DOE to publish the following reports:

- Annual Technical Progress Reports.
- Topical Reports.
- Final Technical Report.
- Public Design Reports.
- Economic Evaluation Report.

5.0 Technical Information Reports

This information is that knowledge or information (unlimited, limited, and classified) resulting from, or pertaining to, the conduct of research and development efforts. This information reports on progress or results of DOE-funded demonstration activities and usually is published as technical reports, journal articles, reprints, theses or dissertations, conference and symposium proceedings, or translations. This may include experimental data, theoretical data, analytical studies, and economic and energy use projections. This information is used by managers, scientists, researchers, and engineers engaged in

scientific and technological efforts, and is the basic intellectual resource for and result of such effort. Types of technical reports are described as follows:

5.1 The Technical Progress Report will summarize the work performed during a specific reporting period and will include the technical and scientific results (both positive and negative) of that period. By mutual agreement, a Technical Progress Review Meeting may take the place of a formal Technical Progress Report. In such cases, a conference record (see paragraph 6.10) and copies of the presentation materials shall be delivered to DOE within 5 days following the Review Meeting and shall constitute the Technical Progress Report for that period. At least once each year, however, a Technical Progress Report describing the progress made during the previous 12 months shall be prepared for publication. The procedures discussed in Section 4.0 apply for any Technical Progress Report to be published.

5.2 Topical Reports, if required, will be defined in the Statement of Work (SOW). These reports usually provide a comprehensive statement of the technical results of the work performed for a specific task or subtask of the SOW, or detail significant new scientific or technical advances. If Topical Reports are to be prepared, DOE will first review the report outline and, once approved, subsequently review the draft report as discussed in Section 4.0.

5.3 The Final Technical Report is a technical account of the total work performed under the agreement. It is a comprehensive description of the results achieved and of the investigations undertaken and includes an analysis of the Participant's view and plan for marketing, commercialization, and technical readiness of the technology demonstrated. It must include tabulations of data, figures, photographs, and bibliographic citations in support of the investigations undertaken and conclusions reached. Where applicable, it summarizes all topical and technical progress reports. The Participant shall, prior to preparation of the draft, provide to DOE the report outline. Subsequent to approval of the report outline, the Participant will deliver a draft copy of the final report 60 days before the completion of the period of performance. The Government shall be allowed 30 days to review the draft copy and to notify the Participant, in writing, of agreement or recommended changes. If the Government does not agree or recommend changes within 30 days of receipt of the draft copy, the report shall be deemed acceptable. A camera-ready copy of the approved final report is due upon conclusion of the operations phase or termination of the Cooperative Agreement, whichever occurs first.

In addition, at least the following deliverables are to be provided as components of the Final Technical Report:

5.3.1 Critical Component Failure Report.

The data in this report will establish a basis for RAM analysis and confirm or modify assumptions that were made in the design phase of the project. Furthermore, these data will serve as a data base for future plants for establishing component and system reliability, availability, and maintainability. Typically, the following items should be reported for each unit/equipment failure:

- Failure identification.
- Description of failure.
- Disposition of failed item.
- Action taken.
- Remarks/recommendations/additional information.

Each piece of equipment should have a failure history report and a maintenance report.

5.3.2 Reliability, Availability, Maintainability (RAM) Analysis Data.

These data will provide RAM characteristics obtained from actual plant operation. They should be consistent in form with the above Critical Component Failure Report to allow for easy and direct comparisons.

5.3.3 Stream Data.

The Participant shall provide to the DOE a complete set of all nonproprietary stream data, including the measured flows, stream properties, and constituents at various operating conditions. These data represent the final status of the information reported in the Final Public Design Report.

5.3.4 Equipment List.

The Equipment List consists of a summary of the major equipment for the plant. Equipment is to be sorted by Flow Diagram, equipment type, and equipment number. General description data are to be provided for each equipment item, including, but not limited to, the number required for operation, size or capacity, major nonproprietary operating and design parameters, costs, associated bulk quantities, and manufacturer and/or vendor. These data represent the final status of the information reported in the Final Public Design Report.

5.3.5 Drawings.

The Participant shall include a complete set of nonproprietary Process Flow Diagrams, Equipment Plot and Elevation Drawings, and Process and Instrumentation Diagrams which describe the plant configuration at the end of the demonstration period. These drawings represent the final status of the drawings presented in the Final Public Design Report.

5.3.6 Plant Cost Data.

The Participant shall include documentation for all costs associated with the construction of the plant, with a breakdown which would permit this information to be used for projecting future plant construction costs.

6.0 Special Reports

In addition to the reports itemized on the Financial Assistance Reporting Requirements Checklist, the Participant shall also provide the deliverables listed in this section. Each deliverable title is followed by a set of symbols in parentheses which indicate delivery information consistent with the abbreviations used on the checklist. The format for the symbols in parentheses is (report frequency/number of copies/addressees) (See Page C-2).

6.1 Environmental Monitoring Plan (O/1,5/A,B).

See Appendix N of the Program Opportunity Notice for guidance in arriving at a mutually agreeable plan. A final approved plan must be delivered to DOE by a mutually agreed upon date.

6.2 Environmental Monitoring Reports (Q,Y, and A/1,5/A,B).

The results of sampling conducted under the Environmental Monitoring Plan (EMP) should be reported in quarterly and annual reports or, if appropriate, test-series reports. Test-series reports should be used if the facility is to be operated under various configurations or with different feedstocks over discrete periods or if a phased approach to monitoring is being used. All sampling results obtained under a given operating condition would then be contained in a single document. Contents of the test-series report should include:

- A summary of plant operations and sampling results.
- A description of any deviations from the EMP.
- Details of the sampling and analytical procedures.
- An analysis of performance of pollution control units.
- The results of all stream, ambient, and workplace sampling separated into compliance and supplemental monitoring.

Appendices should be included which contain the sampling and analytical data sheets and a Quality Assurance/Quality Control (QA/QC) program analysis.

During test series or phased operation, quarterly and annual reports will still be required. However, they should emphasize plant conditions and the types of sampling conducted during the reporting period rather than the results of the sampling. These reports should include:

- A description of project status.
- A summary of scheduled and completed sampling.
- A discussion of any regulatory compliance issues.
- A review of QA/QC activities during the period.
- Copies of compliance reports submitted to regulatory agencies during the period.

If the facility is not operated in a phased or test series mode, then only quarterly and annual reports are required. These reports should contain the information outlined above for the test series reports. A separate fourth quarter and annual report are not required. The fourth quarter data should be included in the annual report.
Quarterly reports are due within 60 days of the end of the calendar quarter. Annual reports are due within 90 days of the end of the calendar year. Test series reports are due within 90 days following completion of the test series. DOE review and approval of these reports are not required.

6.3 Project Evaluation Plans (Each budget period except last/1,5/A,B).

Within 90 days after the beginning of each budget period except the last, the Participant will submit to the DOE for DOE approval a Project Evaluation Plan. This Plan will identify and describe the criteria by which the technical and economic feasibility of the project are to be measured. The Project Evaluation Plan as reviewed, revised, and approved by DOE will be used by the Participant for the preparation of a Project Evaluation Report to be submitted to DOE at least 60 days prior to the end of the budget period for which the Project Evaluation Plan was prepared. The approved Plan will be used by DOE as the basis for the DOE decision to continue the project to the subsequent budget period.

6.4 Project Evaluation Reports (Each budget period except last/1,5/A,B).

Formal project reviews will be conducted during each budget period. Project Evaluation Reports will provide the basis for the decision to proceed to the next budget period. These reports should describe in detail the project status and explain any deviations from the project management plan, milestone schedule, and cost plan. These reports are to be submitted 60 days prior to the completion of each budget period except the last one.

6.5 Public Design Reports (Phases 1 and 2/1,5/A,B).

The purpose of the Public Design Reports is to consolidate for public use all available nonproprietary design information on the project. Two separate reports are required. The first report is based on the preliminary design information and is due at the end of preliminary design. The second report is based on detailed design information and is due after completion of Phase 1, 60 days prior to completion of Phase 2. The second report should contain sufficient background information to provide an overview of the project and pertinent cost data. Since the scope of the reports is limited to nonproprietary information, their content will not be sufficient to provide a complete tool in designing a replicate plant. However, these reports will serve as a reference for the design considerations involved in a commercial-scale facility.

The reports should include an overview description of the technology and a summary of the mass and energy balances for the process. They should also define the overall process performance requirements and describe the evaluations and operating philosophies upon which those performance requirements are based. A summary cost estimate of capital and operating costs and, if possible, an analysis of how costs could be improved for future commercial projects should also be included.

The following deliverables are also to be included as components of the first Public Design Report addressing the preliminary design:

6.5.1 Process Flow Diagrams

The Participant shall provide a complete set of non-proprietary Process Flow Diagrams with all updates and modifications.

6.5.2 Stream Data

The Participant shall provide a complete set of all nonproprietary stream data. This would include both the expected values and ranges of flows, stream properties, and constituents at various operating conditions.

6.5.3 Equipment List

The Equipment List consists of a summary of the major equipment for the plant. Equipment is to be sorted by Flow Diagram, equipment type, and equipment number. General description data are to be provided for each equipment item, including, but not limited to, the number required for operation, size or capacity, major nonproprietary operating and design parameters, and manufacturer and/or vendor.

The following deliverables are also to be included as components of the Final Public Design Report:

6.5.4 Stream Data

The participant shall provide to the DOE a complete set of all nonproprietary stream data. This would include both the expected values and ranges of flows, stream properties, and constituents at various operating conditions.

6.5.5 Equipment List

The Equipment List consists of a summary of the major equipment for the plant. Equipment is to be sorted by Flow Diagram, equipment type, and equipment number. General description data are to be provided for each equipment item, including, but not limited to, the number required for operation, size or capacity, major nonproprietary operating and design parameters, costs, associated bulk quantities, and manufacturer and/or vendor.

6.5.6 Drawings

The Participant shall include a complete set of nonproprietary Process Flow Diagrams, Equipment Plot and Elevation Drawings, and Process and Instrumentation Diagrams, which describe the plant configuration at the end of the demonstration period.

6.5.7 Plant Cost Data

The Participant shall include documentation for all costs associated with the construction of the plant, with a breakdown which would permit this information to be used for projecting future plant construction costs.

6.6 Environmental Report (A/1,5/A,B).

The Participant shall submit the environmental information specified in Appendix J of the Program Opportunity Notice. This detailed site and project specific information will be used as the basis for site specific NEPA documents to be prepared by DOE for each selected project. These documents shall be prepared, considered, and published in full conformance with the requirements of 40 CFR Parts 1500 to 1508, and in advance of a go/no-go decision to proceed beyond Phase 1. Federal funds for the Clean Coal Technology Program

will not be provided for project activities beyond Phase 1 until the NEPA process has been successfully completed.

The Participant shall update the Environmental Report as required to reflect any project or process changes which would significantly alter the content or conclusions of the report.

6.7 Federal Cash Transactions Report (SF272) to be used for advanced payment only (M/3/B).

DOE review and approval of these reports are not required.

6.8 Technical Conference Papers and Journal Articles (A/1,3/A,B).

Publication in open literature is desirable; however, DOE requires a prepublication review and patent clearance. Copies of the proposed papers or articles must be provided to DOE as explained in Section 4.0 above.

6.9 Public Information Release (A/1,5/A,B). See Article XXIII of this Cooperative Agreement.

6.10 Conference Record (A/1,3/A,B).

The Conference Record documents for the DOE COTR, DOE Contracting Officer, and the Participant an understanding of significant decisions, direction or redirection, or required actions resulting from meetings with DOE representatives. It is required for all formal project review meetings, including technical progress reviews, design and construction reviews, and operations reviews. It is also required for any meeting, conference, or phone conversation in which a decision is made that may significantly change the schedule, labor, cost, or technical aspects of the contractual agreement or the approved baseline plans. The report shall contain the following information as applicable:

- Report title ("Conference Record"), number, and the date prepared.
- Agreement title and number and the Participant's name and address.
- Date of meeting or telephone conversation with a list of those involved and their titles.
- Subject(s) discussed, decisions reached, and directions given.
- Variances from previous directions and conclusions.
- Required actions.
- Distribution.
- Signature of preparer.

6.11 Hot Line Report (A/1,4/A,B).

The "Hot Line" Report may be used to report a major breakthrough in research, development, or design; an event causing a significant schedule slippage or cost overrun; achievement or failure to achieve

an important technical objective; or any requirement for quickly documented direction or redirection. Examples include:

- Any change in the availability of funds which the Participant believes may have a material and adverse effect on the project.

- Any change in supply contracts or market conditions which the Participant believes may have a material and adverse effect on the project.

- Any suspension, revocation or denial of a permit or any notice of a potential violation of a permit, the loss or absence of which the Participant believes may have a material and adverse effect on the project.

- Any default or threatened default by any contractor that the Participant believes may have a material and adverse effect on the project.

The report shall be submitted by the most rapid means available, usually electronic, and should confirm telephone conversations with DOE representatives. Identification as a "Hot Line Report" serves notice at each link in the delivery chain that speed in handling is required. Unless otherwise agreed by the parties involved, DOE is expected to take action and respond in a similarly expeditious manner. The report should include:

- Participant's name and address.
- Agreement title and number.
- Date.
- Brief statement of problem or event.
- Anticipated impacts.
- Corrective action taken or recommended.

In addition to those incidents noted above, special attention should be given to using Hot Line Reports to document the incidents listed below.

- Any fatal or imminently fatal injury, accident, or any incident involving hospitalization of five or more persons is to be immediately reported.

- Any significant environmental permit violation is to be reported as soon as possible, but within 12 hours of incident.

- Other incidents that have the potential for high visibility in the media are to be reported as quickly as possible, but no later than 12 hours. When an incident is reported in accordance with the following two items, the participant shall conduct an investigation of its cause and make an assessment of the adequacy of resultant action. A written report is required on a schedule to be established at the time of the initial report.

- Any unplanned event which is anticipated to cause a schedule slippage or cost increase significant to the project is to be reported as soon as possible but within 5 working days.

- An incident which causes a significant process or hazard control system failure, or is indicative of one which may lead to any of the above defined incidents, is to be reported as soon as possible, but within 5 working days. When an event results in the need to issue a written or verbal statement to the local media, the statement is to be cleared first, if possible, by the appropriate Energy Technology Center's Public Information Officer and coordinated with the COTR.

DOE review and approval of these reports are not required.

7.0 Reports Called for in Statement of Work

The Participant shall provide the following deliverables called for in the Statement of Work, Attachment A:

7.1 PHASE 1

7.1.1 Project Management Plan (O,A/1,5/A,B)

A detailed Project Management Plan shall be provided in accordance with the guidelines in Appendix 1 to Attachment A. The plan shall be updated as appropriate to reflect significant changes to the project baseline.

7.2 PHASE 2

7.2.1 Project Management Plan (A/1,5/A,B)

The plan shall be updated as appropriate to reflect significant changes to the project baseline.

7.2.2 Plant Start-Up Plan (A/1,5/A,B)

The Participant shall prepare a Plant Start-Up Plan. The plan will be defined by the system descriptions (SD's) and a plant start-up schedule. The boundary of each SD will be identified on appropriate drawings. The plant start-up schedule incorporating the SD's will be developed after completion of a list of SD's during Phase 2. The plan will be submitted to the DOE at least 60 days prior to its implementation.

7.2.3 Test Plan (A/1,5/A,B)

The Participant shall develop a Test Plan for the demonstration period of the facility. This document will provide for demonstration tests to obtain the data base and experience necessary for the detailed design, operation, control and maintenance of large-scale commercial plants. The Test Plan

shall describe the overall test program goals, the strategies for achieving those goals, and the sequencing of individual tests. It should include detailed discussion of such topics as test matrices, procedures for sampling and analysis, data manipulation methods, success criteria, and manning schedules. It should also designate the Participant's plans for preparing and submitting the Demonstration Test Reports described in Section 7.3.2 below.

The Test Plan is to be developed in Phase 2 and submitted to the DOE for approval at least 60 days prior to the commencement of Phase 3.

7.2.4 Start-Up and Modification Report (A/1,5/A,B)

A Start-Up and Modification Report shall be provided to DOE for review within 60 days following the completion of plant start-up. Any process or equipment modifications made to the originally reported design of plant, as a result of late design changes or deficiencies encountered during commissioning and start-up activities, should be documented. The scope of the report should:

- Describe the problem with the particular process or item of equipment.
- Identify the modification that was implemented to correct the problem.
- Evaluate the impacts of the modification.
- Document the cost of the modification.

The start-up activities should also be documented giving information such as:

- Planned and actual start-up schedule.
- Production rate buildup.
- Environmental data.
- Cost data on start-up and start-up modifications.

If performance tests are carried out, the results should be reported in this document. Performance tests are tests carried out on process units to verify that each unit will operate as designed before the unit is accepted from the vendor and turned over to the plant operating staff. Typically, these tests will provide the operating data (flow rate, temperature, pressure, analytical data, etc.) needed to confirm the performance of the unit.

7.3 PHASE 3

7.3.1 Project Management Plan (A/1,5/A,B)

The plan shall be updated as appropriate to reflect significant changes to the project baseline.

7.3.2 Demonstration Test Reports (Q,A/1,5/A,B)

Demonstration Test Reports shall document and discuss plant operating data and performance. These reports shall be based, if possible, on logical subdivisions in the test plan (campaigns, test series, etc.) which differentiate a significant change in feedstock, a period of sustained operation, or a change in operating conditions, for example. The reports shall be provided on at least a quarterly basis, even if a natural test plan segment cannot be documented within that time frame.

7.3.3 Disposition Plan (A/1,3/A,B)

(A Disposition Plan is not required if disposition of the demonstration facility was not proposed.)

7.3.4 Technology Performance and Economic Evaluation Report (A/1,5/A,B)

The Participant shall prepare and provide to DOE an Economic Evaluation Report which discusses the Participant's results of an economic analysis and evaluation for commercializing the demonstrated technology. This report should be a natural result of the Participant's commercial plant design and should discuss the Participant's experience in operating the technology. The report should include a discussion of costs associated with:

- Capital equipment.
- Land.
- Coal.
- Water.
- Electricity.
- Operating costs.
  - Personnel.
  - Expendables.
  - Fees.
- Project contingency.

- Process contingency.
- Construction costs.
- Interest rates assumed.

A draft of this report shall be submitted to DOE no later than 60 days prior to the completion of Phase 3, upon earlier completion of the Cooperative Agreement, or upon termination of the Agreement, whichever occurs first.

ATTACHMENT D

CONTRACT CLAUSES

CONTRACT CLAUSES

For purposes of this Attachment, the term "contract" means a procurement contract awarded under the Cooperative Agreement and a procurement subcontract awarded under such a contract; the term "solicitation" means an invitation for bids, request for quotations or proposals, or any other type of solicitation issued by the Participant for the purpose of awarding a contract. The following clauses shall be included, as indicated below, in contracts and in solicitations:

1. For contracts other than small purchases: administrative, contractual, or legal remedies for violations or breaches of contract terms.

2. For contracts over $10,000: provisions for terminating the contract for default or for convenience, including the manner by which the termination will be effected and the basis for settlement.

3. For construction contracts over $10,000: a requirement that the contractor comply with Executive Order 11246 of September 24, 1965 entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967 and as supplemented in U.S. Department of Labor regulations (41 CFR Part 60).

4. For all construction or repair contracts: a requirement that the contractor comply with the Copeland Anti-Kickback Act (18 U.S.C. 874) as supplemented in U.S. Department of Labor regulations (29 CFR Part 3).

5. For construction contracts over $2,000 and for all contracts over $2,500 involving the services of mechanics or laborers: a requirement that the contractor comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by U.S. Department of Labor regulations (29 CFR Part 5).

6. For all contracts other than small purchases: a clause requiring the contractor to furnish such information the Participant must receive in order to comply with the reporting requirements under this Cooperative Agreement.

7. For all contracts over $10,000: a clause requiring the contractor to retain records pertinent to the contract for three years after the contractor receives final payment. The clause must also provide that if an audit, litigation, or other action involving the contract records commences before the end of the three-year retention period, the records must be retained until

all issues arising out of the action are resolved, or until the end of the three-year period, whichever is later.

8. For all contracts over $10,000: a clause providing that the Participant, DOE, and the Comptroller General of the United States, or any of their duly authorized representatives shall have access to any books, documents, papers, and records (including those on electronic media) of the contractor which are directly pertinent to that specific contract for the purpose of making audit, examination, excerpts, and transcripts. This clause shall specify that the right of access shall last as long as the contractor retains records which are directly pertinent to that specific contract.

9. For contracts and subcontracts over $100,000: a clause requiring the contractor or subcontractor to comply with all applicable standards, orders, or requirements issued under section 306 of the Clean Air Act (42 U.S.C. 1857(h)), section 508 of the Clean Water Act (33 U.S.C. 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15).

10. For all contracts and subcontracts: a clause requiring compliance with all applicable mandatory standards and policies relating to energy efficiency contained in the state energy conservation plan issued pursuant to the Energy Policy and Conservation Act (42 U.S.C. 6201, et seq.).

11. In solicitations: the following Instructions for and Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions

Instructions for Certification

1. By signing and submitting this proposal, the prospective lower tier Participant is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier Participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the U.S. Department of Energy may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier Participant shall provide immediate written notice to the person to which this proposal is submitted if at

any time the prospective lower tier Participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "Nonprocurement List," "DOE List," "Participant," "person," "primary covered transaction," "principal, " "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the DOE rules implementing Executive Order 12549. See, 10 CFR Part 1036 [53 F.R. 19204 (May 26, 1988)]. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of these rules.

5. The prospective lower tier Participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the U.S. Department of Energy.

6. The prospective lower tier Participant further agrees by submitting this proposal that it will include this clause titled "*Certification Regarding Debarment, Suspension, Ineligibility and* Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A Participant in a covered transaction may rely upon a certification of a prospective Participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A Participant may decide the method and frequency by which it determines the eligibility of its principals. Each Participant may, but is not required to, check the Nonprocurement List.

8. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and

information of a Participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transactions authorized under paragraph 5 of these instructions, if a Participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the U.S. Department of Energy may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions

(1) The prospective lower tier Participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) Where the prospective lower tier Participant is unable to certify to any of the statements in this certification, such prospective Participant shall attach an explanation to this proposal.

APPENDIX M

MODEL REPAYMENT AGREEMENT

MODEL REPAYMENT AGREEMENT

ARTICLE I. GENERAL OBJECTIVE

The purpose of this agreement is to set forth the terms and conditions under which _____ (defined herein as the Participant) shall repay to the United States Department of Energy (DOE) an amount up to (i.e., not to exceed) the Government's share of total project costs paid under Cooperative Agreement No. DE- _____.

ARTICLE II. DEFINITIONS

"Contracting Officer" means the DOE official authorized to execute awards, financial agreements, and amendments thereto on behalf of DOE and who is responsible for administering this Repayment Agreement.

"Cooperative Agreement" means the financial assistance award made by the United States Department of Energy (DOE) to the Participant, Instrument Number _____ on _____, 1990 and subsequent amendments.

"DOE" means the United States Department of Energy and any successor department or agency.

"DOE share" means the portion of the total project costs paid by DOE under the Cooperative Agreement.

"Government" means the government of the United States, including DOE.

"Participant" means [*INSERT NAME OF ORGANIZATION SIGNING THE REPAYMENT AGREEMENT*] *and its successors and assigns.*

"Project" means the set of activities described in Article IX (Allowable Pre-Award Costs) and in Attachment A, Statement of Work, of the Cooperative Agreement.

"Total project costs" means the total amount of allowable direct and indirect costs incurred by the Participant and paid, in part, by DOE under the Cooperative Agreement.

"United States" means any of the several States of the United States, the District of Columbia, the Commonwealth of Puerto Rico, and any territory or possession of the United States.

ARTICLE III. TERM OF THIS REPAYMENT AGREEMENT

This Repayment Agreement shall become effective on the date specified in the Cooperative Agreement as the end of Phase 3 (Operation), except that if the Participant unilaterally withdraws or terminates its participation under the Cooperative Agreement, this Repayment Agreement shall become effective on the date the Cooperative Agreement is terminated. This Repayment Agreement shall expire 20 years from its effective date or on the date the entire DOE share has been repaid. This Repayment Agreement may be terminated upon a determination by the Secretary of Energy or designee that repayment places the Participant at a competitive disadvantage in domestic or international markets.

ARTICLE IV. DEMONSTRATION TECHNOLOGY

For purposes of this Repayment Agreement, the "Demonstration Technology" shall consist of [*DOE and the Participant will agree on this description*].

ARTICLE V. AMOUNT OF REPAYMENT

The amount of the Participant's repayment obligation shall be based only on the sale, lease, or licensing of the Demonstration Technology, as defined in Article IV, in applications and for use at facilities located in the United States. The amount of repayment shall be based upon the revenues from the sum

of one or both of the following sources during commercialization of the Demonstration Technology:

Repayment Amount	Revenue Source
0.5%	Gross revenues from equipment sales/leases
5.0%	Royalties and licensing fees

For purposes of determining the amount of repayment, commercialization shall be deemed to have begun on the effective date of this Repayment Agreement or [*INSERT DESCRIPTION OF TRIGGERING EVENT(S) WHICH DEFINE THE GRACE PERIOD: E.G., ALL SALES AFTER THE 3RD UNIT OF THE DEMONSTRATION TECHNOLOGY*], whichever occurs later.

(A) Sales/Leases of Equipment

The Participant shall pay DOE an amount equal to 0.5% of the gross revenues from the sale or lease of equipment manufactured, fabricated, or assembled as a result of commercialization of the Demonstration Technology. The Participant shall include in all contracts or agreements with any entity which is involved, directly or indirectly, in manufacturing, selling, leasing, or licensing the use of Demonstration Technology equipment, a provision requiring that sales and leases of such equipment and associated revenue be reported on an annual basis to the Participant. A list of entities (including name, address, and telephone number of responsible official) subject to this reporting requirement is provided in Attachment A and shall be updated, as necessary, by the Participant.

(B) License Fees

The Participant shall pay DOE an amount equal to 5.0% of the gross revenues from license fees paid for use of the Demonstration Technology. The Participant shall include in all contracts or agreements with any entity which acquires the right to license the use of the Demonstration Technology, a provision requiring that all such licenses and sub-licenses and associated revenues be reported on an annual basis to the Participant. A list of entities (including name, address, and telephone number of responsible

official) subject to this reporting requirement is provided in Attachment B and shall be updated, as necessary, by the Participant.

(C) Alternative Sources

[*INSERT ANY PERTINENT PROVISIONS DURING NEGOTIATIONS*]

ARTICLE VI. SCHEDULE OF REPAYMENTS

Payments to DOE shall be calculated on an annual basis, and shall be due within 60 days after each one-year period following the effective date of this Repayment Agreement.

ARTICLE VII. REPORTING AND RECORD RETENTION REQUIREMENTS

(A) Annual Report to DOE

Within 60 days after the end of each one-year period, the Participant shall submit a written report to DOE which, for the one-year period just elapsed, provides the applicable data described below:

(1) The total dollar amount of sales and leases of Demonstration Technology equipment;

(2) Quantities and descriptions of Demonstration Technology equipment sold and leased;

(3) The total dollar amount of license fees paid for use of the Demonstration Technology;

(4) Quantities and descriptions of Demonstration Technology transactions under which license fees were paid;

(5) The total amount of revenue reported by each entity identified in Attachments A and B;

(6) Sum of the total amounts of gross revenues from each of the sources described in Article V, Sections A and B; and

(7) The total amount owed or paid to DOE, and the amount of the DOE share remaining to be paid in succeeding years under this Repayment Agreement.

(B) Period of Retention

With respect to each annual report to DOE, the Participant shall retain, for the period of time prescribed in this paragraph, all related financial records, supporting documents, statistical records, and any other records the Participant reasonably considers to be pertinent to this Repayment Agreement. The period of required retention shall be from the date each such record is created or received by the Participant until three years after one of the following dates, whichever is earlier: the date the related annual report is received by DOE; or the date this Repayment Agreement expires or the final payment to DOE is received. If any claim, litigation, negotiation, investigation, audit, or other action involving the records starts before the expiration of the three-year retention period, the Participant shall retain the records until such action is completed and all related issues are resolved, or until the end of the three-year retention period, whichever is later. The Participant shall not be required to retain any records which have been transmitted to DOE by the Participant.

(C) Authorized Copies

Copies made by microfilm, photocopying, or similar methods may be substituted for original records. Records originally created by computer may be retained on an electronic medium, provided such medium is "read only" or is protected in such a manner that the electronic record can be authenticated as an original record.

(D) Access to Records

DOE and the Comptroller General of the United States, or any of their authorized representatives, shall have the right of access to any books, documents, papers, or other records (including those on electronic media) which are pertinent to this Repayment Agreement. The purpose of such access is limited to the making of audits, examinations, excerpts, and transcripts. The right of access described in this paragraph shall last as long as the Participant retains records which are pertinent to this Repayment Agreement.

(E) Restrictions on Public Disclosure

The Federal Freedom of Information Act (5 U.S.C. § 552) does not apply to records the Participant is required to retain by the terms of this Repayment Agreement. Unless otherwise required by law or a court of competent jurisdiction, the Participant shall not be required to disclose such records to the public.

(F) Flow Down of Records Retention and Access Requirements

In any contract or other agreement subject to the reporting requirements described in Article V, Sections A and B, the Participant shall include clauses substantially similar to the records retention and access requirements set forth in sections (B) and (D) of this Article.

ATTACHMENTS

A. Purchasers and Lessees of Demonstration Technology Equipment.
B. Entities Required to Pay License Fees.

APPENDIX N

ENVIRONMENTAL MONITORING PLAN GUIDELINES

GUIDELINES FOR ENVIRONMENTAL MONITORING PLAN

I. PURPOSE

The Department of Energy (DOE) views the identification and characterization of areas of concern and the development of an information base for the assessment and mitigation of impacts associated with the replication of Clean Coal Technology projects to be a fundamental purpose of environmental and health monitoring and an important component of the demonstration project. Monitoring should identify the environmental constraints and/or advantages of potential commercial versions of the demonstrated technology. In addition, environmental monitoring may be necessary to quantify the project-specific and site-specific environmental impacts predicted in the National Environmental Policy Act (NEPA) documentation, to detect any environmental and health problems requiring remedial action, and to confirm the performance of environmental mitigation measures implemented as part of the project. Toward these ends, DOE requires that the participant perform a broad range of monitoring activities, to the extent appropriate to the circumstances of the project, related to potential environmental and health impacts of the project and technology, and to document these monitoring activities in the form of an Environmental Monitoring Plan (EMP).

II. ORGANIZATION AND APPROACH

DOE requires the Participant to complete an EMP and to specifically address two classes of monitoring activity: compliance monitoring and supplemental monitoring. The two classes are defined in terms of the objectives for monitoring and serve as a basis for systematic planning and analysis. The classes are as follows:

Class I, Compliance Monitoring, is the monitoring required by other agencies of Federal, state and local government (other than DOE) to satisfy statutes, regulations, and terms of leases, permits, grants, and other requirements. The EMP documents the extent of compliance monitoring activities, provides for

reporting of relevant results to DOE, and shows their relationship to monitoring activities to meet the objectives of Supplemental Monitoring.

Class II, Supplemental Monitoring, is monitoring required in addition to compliance monitoring to establish the environmental characteristics and potential impacts of the clean coal technology and associated facilities, processes, and activities. This monitoring is intended to satisfy two objectives: first, to develop the information base for identification, assessment, and mitigation of environmental problems associated with the replication of the technology; and second, to identify and confirm environmental impacts and performance predicted in the NEPA documentation.

With regard to the first objective, activities may include but are not limited to measurements of processes, feedstocks, operating conditions, discharges, ambient environmental conditions, industrial hygiene, occupational health and safety, and impacts on public health and ecological systems. Environmental characterization emphasizes the special attributes of the technology and pollutants specific to it, rather than attributes common to existing commercial technologies. The Participant will be required to identify the salient process and operating parameters that are likely to affect environmental discharge rates and compositions, waste generation, and other relevant environmental characteristics of construction and operation. The EMP must show how information about those parameters will be reported and related to analyses of the monitoring data. Monitoring of ambient environmental concentrations and impacts may be required to assist characterization of the source and/or to assess the transport and effects of pollutants or other impacts of the technology that are poorly understood.

To meet the second objective of supplemental monitoring, the Participant may be required to conduct monitoring activities to identify and confirm potential environmental impacts identified in the Environmental Report and in subsequent NEPA documentation. It is recognized that, in some cases, no supplemental monitoring may be required to meet this objective. In the latter cases, the basis for the determination that such supplemental monitoring is not required should be stated in the Draft EMP and Final EMP.

Monitoring should be considered for all phases of the project, including pre-construction, pre-operation, demonstration, post-demonstration operation, shut-down, site reclamation, and long-term monitoring of disposed wastes, disturbed ecosystems, and performance of mitigative measures, where appropriate. Environmental impacts of operation and disposition of the facility after completion of the CCT demonstration phase must be considered by DOE, where required by its responsibilities under NEPA. The DOE, in consultation with the Participant and others, will determine whether and to what degree monitoring is required to ensure that the continued safety and limitations of adverse environmental impacts resulting from the CCT Demonstration Project predicted in NEPA documentation will be achieved. The EMP will reflect the results of this determination.

In cases of the uncertain occurrence of environmental effects or formation and transport of pollutants to media, a phased approach to monitoring should be considered. In such cases, initial characterization or monitoring should be used to determine the need and scope for further monitoring activity. Participants should indicate analyses, reports, decision milestones, and points for DOE review in the EMP.

III. IMPLEMENTATION

TIMING

The EMP shall be developed, in consultation with DOE, in two stages, as described herein. The Participant is required to develop a Draft EMP that must be delivered to DOE during the first project budget period. The Final EMP must then be developed in consultation with DOE no later than 60 days after commencement of Phase 2 of the project. It should be recognized that the Final EMP is subject to revision and updating as the project continues.

CONTENTS OF EMP

The Draft EMP may contain general information about the monitoring activities; whereas, the Final EMP will specify the details regarding the sampling locations,

monitoring parameters, and procedures. A suggested format for the EMP is provided as Attachment A to this Appendix. This format is not mandatory, but all topics that are relevant should be addressed.

EMP Purpose and Scope - This section should define the overall approach to the monitoring and measurement activities. If a phased approach is to be used, the logic flow and decision criteria should be discussed. The scope of the monitoring should be described in terms of both duration and environmental media considered.

Project/Process Description - The technology should be described, with reference to appropriate process flow diagrams. Process and discharge streams should be identified, along with descriptions of pollution control systems.

Compliance Monitoring - The permits and the conditions of the permits should be presented in this section. The monitoring requirements of the permits should be discussed in terms of both the type of monitoring (source, ambient, etc.) and the timing (i.e., phase of the project). This provides the basis for determining what types of supplemental monitoring may be required.

Supplemental Monitoring - The two overall objectives related to supplemental monitoring should be discussed: (1) to develop the information base for identification, assessment, and mitigation of environmental problems associated with the replication of the technology; and, (2) to identify and confirm environmental impacts and performance predicted in the NEPA documentation. The specific plans to meet these objectives should be described. The parameters that establish process operating conditions and determine environmental discharge characteristics can be defined. The procedures for establishing environmental performance and operating conditions should be addressed. Finally, the schedule for this monitoring should be described in terms of duration and frequency.

Integration of Compliance and Supplemental Monitoring - In order to eliminate any redundancy between compliance and supplemental monitoring, the two should be integrated, with the monitoring activities then broken down by project

phase and monitoring media. Tables should be prepared that show the parameters to be monitored, the stream/sampling point identification, the frequency of sampling, and the value to be reported (e.g., average, minimum/maximum, range).

Data Management & Reporting - This section should describe the data management system to be used. The reporting schedule should be given (e.g., quarterly and annual reports). The content and format of the reports should be described, including the types of analyses to be provided (e.g., heat and material balances, trace element distribution, pollution control equipment performance).

ATTACHMENT A

GUIDELINES FOR ENVIRONMENTAL MONITORING PLAN

ENVIRONMENTAL MONITORING PLAN

-- SUGGESTED FORMAT --

1.0 SUMMARY

2.0 INTRODUCTION

- 2.1 EMP Purpose and Scope
- 2.2 Background & History of the Project
  - 2.2.1 Project Schedule
  - 2.2.2 Project Site

3.0 PROJECT/PROCESS DESCRIPTION

- 3.1 Process Flow Description
- 3.2 Site & Facilities Description
  - 3.2.1 Raw Material Storage & Handling
  - 3.2.2 Product Storage & Handling
  - 3.2.3 Intermediates & By-Products Storage & Flows
  - 3.2.4 Utilities & Offsite Facilities (including waste disposal sites)
- 3.3 Emissions & Discharges
  - 3.3.1 Atmospheric Emissions & Control Systems
  - 3.3.2 Aqueous Discharges & Control Systems
  - 3.3.3 Waste Discharges & Management Systems

4.0 COMPLIANCE MONITORING

- 4.1 Scope of Permits & Permit Conditions
  - 4.1.1 Source Monitoring
  - 4.1.2 Ambient Monitoring
  - 4.1.3 Workplace Monitoring
  - 4.1.4 Process & Operating Conditions Monitoring

6.1.5 Aquatic Ecology

6.1.6 Noise Levels

6.2 Construction Monitoring

6.2.1 Gaseous Discharges

6.2.2 Aqueous Discharges

6.2.3 Waste Generation and Disposal

6.2.4 Noise Levels

6.2.5 Ambient Impacts

6.2.6 Worker Health & Exposure

6.3 Operational Monitoring

6.3.1 Process and Operating Conditions

6.3.2 Gaseous Streams

6.3.3 Aqueous Streams

6.3.4 Solid Wastes

6.3.5 Ambient Air Quality

6.3.6 Surface Water Quality

6.3.7 Ground Water Quality

6.3.8 Worker Health & Exposure

6.3.9 Noise Levels

6.4 Post-Operational Monitoring

6.4.1 Ambient Air Quality

6.4.2 Surface Water Quality

6.4.3 Ground Water Quality

6.4.4 Terrestrial Ecology

6.4.5 Aquatic Ecology

6.4.6 Disposal Site Conditions

7.0 Data Management & Reporting

7.1 Purpose & Scope

7.2 Data Management System

7.3 Reporting Schedule

7.4 Content & Format of Reports

Appendices

NEPA Documentation

Waste Management Plan

Industrial Hygiene Program

Sampling & Analytical Procedures

QA/QC Program

APPENDIX O

SOURCES OF FUNDS

SOURCES OF FUNDS

	Phase 1	Phase 2	Phase 3
CASH EQUITY			
Identify currently available funds to be dedicated to the project:			
o Proposer:	_____	_____	_____
o Sponsor/Guarantor:	_____	_____	_____
o Partner (Limited/General):	_____	_____	_____
o Subrecipient:	_____	_____	_____
o Other (identify) _____:	_____	_____	_____
If applicable, identify the method of raising additional required equity contributions (e.g., public offering):			
o Proposer:	_____	_____	_____
o Sponsor/Guarantor:	_____	_____	_____
o Partner (Limited/General):	_____	_____	_____
o Subrecipient :	_____	_____	_____
o Other (identify) _____:	_____	_____	_____
SECURED/UNSECURED DEBT			
Identify proposer's assumptions regarding the interest rate and annual debt service for each source of anticipated debt financing:			
o Bank:	_____	_____	_____
o Insurance Company:	_____	_____	_____
o Public Issue:	_____	_____	_____
o Vendor:	_____	_____	_____
o Other (identify) _____:	_____	_____	_____

	Phase 1	Phase 2	Phase 3
GRANTS			
Identify the source of each grant:			
o State:	_____	_____	_____
o Local:	_____	_____	_____
o Industry:	_____	_____	_____
o Other (specify) _____:	_____	_____	_____
CONTRIBUTED EQUIPMENT OR OTHER PROPERTIES			
Identify the property and specify the value:			
o _____:	_____	_____	_____
o _____:	_____	_____	_____
o _____:	_____	_____	_____
EQUIPMENT LEASING			
o Bank:	_____	_____	_____
o Leasing Company:	_____	_____	_____
o Vendor:	_____	_____	_____
o Other (identify) _____:	_____	_____	_____
PROJECT REVENUES			_____
(See Section 7.3)			

OTHER

Identify:

o _____:	_____	_____	_____
o _____:	_____	_____	_____
Total Non-DOE Funding	_____	_____	_____
DEPARTMENT OF ENERGY	_____	_____	_____
TOTAL FUNDING	_____	_____	_____

NOTE: Totals for each Phase should agree with Exhibit C of Appendix K.

APPENDIX P

ENERGY PROJECTIONS

TABLE OF CONTENTS

INTRODUCTION

The purpose of this Appendix is to aid the proposer in responding to DOE's request for a quantitative market description. The projections are extracted from Chapters 2 and 3 of a recent DOE report: Long Range Energy Projections to 2010, DOE, Office of Policy Planning and Analysis (DOE/PE-0082), July 1988.

FREE-WORLD ENERGY PROJECTIONS

Estimates of regional fuel-specific, free-world historical energy data and Reference Case energy projections for the period of 1970 to 2010 are presented in Tables 2-1 through 2-6. Table 2-1 provides assumption and the world oil price, while Table 2-2 presents growth rates for liquids consumption, total energy consumption and macroeconomic growth. Tables 2-3, 2-4 and 2-5 show free-world energy consumption, production and trade by fuel, respectively. Finally, Table 2-6 summarizes free-world liquids production and consumption and disaggregates the OECD liquids consumption projections into four OECD sub-groups.

U.S. ENERGY PROJECTIONS

Estimates of U.S. historical energy data and Reference Case energy projections for the period of 1960 to 2010 are presented in Tables 3-1 through 3-15. Table 3-1 summarizes world oil prices, economic growth and other assumptions. Table 3-2 presents growth rates for the world oil price, the U.S. economy, total primary energy consumption, and electricity consumption. Table 3-3 contains energy resource and product prices; Table 3-4 summarizes energy production, and Table 3-5 summarizes energy consumption. Tables 3-6 through 3-9 show energy use in the energy conversion, residential and commercial, industrial, and transportation sectors, respectively. Tables 3-10 to 3-13 present the energy production picture for oil, gas, coal, and renewable energy, respectively.

Questions always arise about the classification of specific energy information. Asphalt is included in the industrial sector. Coal coke is considered to be used for energy purposes (as opposed to being a non-energy feedstock) even though a portion of the carbon in the coke is involved in a non-energy chemical reaction in steel making. All non-energy chemical reaction in steel making. All non-energy feedstocks are included in the industrial sector. Electricity generation is treated as part of an energy transformation process; synthetic fuels production is another example of energy transformation. It is important to properly account for the fuels used in these processes in order to avoid double counting their contribution in the U.S. energy market.

TABLE 2-1: REFERENCE CASE--KEY FREE-WORLD ASSUMPTIONS AND WORLD OIL PRICE

YEAR	GDP INDEX (1986=1.00)						WORLD OIL PRICE[a] ($1986 /BBL)	MAXIMUM SUSTAINABLE OPEC CAPACITY[b] (MMBD)		NET CPE EXPORTS (MMBDOE)		
	OECD			OPEC	REST OF FREE WORLD	AVERAGE		LOW	HIGH	OIL	GAS	COAL
	U.S.	OTHER	AVERAGE									
HIST.												
1970	0.641	0.753	0.705	0.337	0.640	0.667	8.25	N/A	N/A	0.8	0.1	0.3
1975	0.727	0.895	0.823	0.566	0.784	0.797	26.01	39.3	39.3	1.1	0.1	0.4
1980	0.870	1.051	0.973	0.780	0.974	0.958	45.34	33.5	33.5	1.2	0.4	0.5
1985	0.974	0.974	0.974	1.023	0.962	0.973	27.76	23.0	27.2	2.0	0.5	0.5
ESTI.												
1986	1.000	1.000	1.000	1.000	1.000	1.000	13.98	23.0	27.0	2.1	0.5	0.5
PROJ.												
1990	1.171	1.126	1.141	1.093	1.166	1.142	20.32	21.0	30.0	1.2	0.5	0.5
1995	1.355	1.255	1.288	1.298	1.381	1.303	26.32	23.5	33.0	- -	0.8	0.6
2000	1.529	1.400	1.443	1.578	1.672	1.486	33.09	28.0	36.0	- -	1.3	0.7
2005	1.730	1.560	1.616	1.922	2.014	1.696	42.10	30.0	37.5	- -	1.7	0.7
2010	1.942	1.740	1.807	2.338	2.438	1.937	52.70	31.0	39.0	- -	1.8	0.7

a) U.S. average refiner acquisition cost of imported crude oil.
b) Includes natural gas liquids (NGL).

TABLE 2-2: REFERENCE CASE--GROWTH RATES
(Percent per Year)

PERIOD	LIQUIDS CONSUMED						PRIMARY ENERGY CONSUMED						ECONOMIC GROWTH					
	OECD			OPEC	REST OF FREE WORLD	AVERAGE	OECD			OPEC	REST OF FREE WORLD	AVERAGE	OECD			OPEC	REST OF FREE WORLD	AVERAGE
	U.S.	OTHER	AVERAGE				U.S.	OTHER	AVERAGE				U.S.	OTHER	AVERAGE			
HIST.																		
1970-1980	1.5	1.5	1.5	7.3	5.5	2.4	1.4	2.6	2.0	7.2	6.5	2.7	3.1	3.3	3.2	8.4	4.2	3.6
1980-1985	-1.7	-3.0	-2.4	5.8	1.4	-1.2	-0.4	0.4	0.0	6.0	3.0	0.8	2.2	-1.5	0.0	5.4	-0.3	0.3
1985-1986	3.1	1.6	2.3	- -	0.0	1.9	0.1	0.4	0.2	0.1	0.3	0.2	2.7	2.7	2.7	-2.3	4.0	2.8
PROJ.																		
1986-1990	0.8	1.5	1.2	-0.8	0.8	0.9	1.5	1.8	1.7	0.0	1.8	1.6	3.4	2.9	3.2	1.3	3.8	3.2
1990-2000	0.0	0.2	0.1	2.0	2.8	0.8	1.2	1.0	1.1	2.7	3.1	1.6	2.7	2.2	2.3	3.7	3.6	2.6
2000-2010	-0.1	-0.6	-0.4	1.7	2.2	0.4	1.4	1.0	1.2	3.5	3.4	1.8	2.4	2.2	2.3	3.9	3.8	2.6
1986-2000	0.3	0.7	0.5	1.1	2.3	0.9	1.3	1.2	1.3	1.9	2.7	1.6	2.9	2.4	2.6	3.3	3.7	2.8
1986-2010	0.1	0.2	0.1	1.4	2.2	0.7	1.4	1.1	1.2	2.5	3.0	1.7	2.7	2.3	2.5	3.5	3.7	2.8

TABLE 2-3: REFERENCE CASE--ENERGY CONSUMED BY THE FREE WORLD[a]
(Million Barrels per Day of Oil Equivalent)

YEAR	LIQUIDS[b] (Includes Coal Liquids)						GAS (Includes Synthetics)						COAL (Excludes Synthetic Feedstocks)						COAL SYNTHETICS CONVERSION LOSS
	OECD						OECD						OECD						
	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL	
HIST. 1970	14.7	18.5	33.2	1.3	4.8	39.3	10.3	1.8	12.2	0.6	0.6	13.5	6.0	7.2	13.2	- -	1.9	15.1	- -
1975	16.3	20.2	36.5	2.2	7.2	45.9	9.4	3.9	13.4	0.9	1.3	15.6	6.0	6.4	12.4	- -	2.3	14.7	- -
1980	17.1	21.5	38.6	2.7	8.3	49.6	9.6	5.2	14.8	1.1	2.2	18.1	7.3	7.5	14.8	- -	3.0	17.8	- -
1985	15.7	18.5	34.2	3.6	8.9	46.7	8.4	6.0	14.4	1.5	2.0	17.9	8.3	7.7	16.0	- -	4.4	20.4	- -
ESTI. 1986	16.2	18.8	35.0	3.6	8.9	47.6	7.9	6.0	13.9	1.5	2.0	17.4	8.2	7.8	16.0	- -	4.5	20.5	- -
PROJ. 1990	16.9	20.2	37.1	3.5	9.3	49.8	8.6	6.5	15.1	1.6	2.6	19.3	8.8	8.0	16.8	- -	4.8	21.6	- -
1995	17.0	20.6	37.6	3.8	10.6	52.0	9.2	7.2	16.4	1.8	2.8	21.1	10.3	8.1	18.3	- -	5.3	23.6	0.1
2000	16.9	20.7	37.6	4.2	12.2	54.1	9.0	8.3	17.3	2.2	3.4	22.9	11.9	8.7	20.6	- -	6.1	26.7	0.1
2005	16.8	20.2	37.0	4.6	13.7	55.4	8.8	9.3	18.1	2.9	4.2	25.1	14.6	9.9	24.5	- -	7.6	32.1	0.1
2010	16.7	19.5	36.2	5.0	15.2	56.4	8.5	9.7	18.2	3.6	5.0	26.8	16.8	12.3	29.1	- -	10.0	39.1	0.1

YEAR	NUCLEAR						RENEWABLES/OTHER						TOTAL PRIMARY					
	OECD						OECD						OECD					
	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL	U.S.	d) OTHER	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL
HIST. 1970	0.1	0.2	0.4	- -	- -	0.5	1.9	2.7	4.6	- -	0.6	5.2	33.0	30.4	63.5	1.9	7.9	73.3
1975	0.9	0.7	1.6	- -	0.1	1.7	2.4	3.2	5.6	- -	0.9	6.5	35.0	34.4	69.4	3.1	11.8	84.3
1980	1.3	1.6	2.9	- -	0.1	3.0	2.6	3.7	6.4	0.1	1.5	8.0	37.9	39.5	77.4	3.9	15.1	96.4
1985	2.0	3.9	5.9	- -	0.3	6.2	2.8	4.2	7.0	0.2	2.0	9.1	37.2	40.3	77.5	5.3	17.6	100.5
ESTI. 1986	2.1	4.3	6.4	- -	0.4	6.8	2.9	4.2	7.1	0.2	2.1	9.4	37.3	41.1	78.5	5.3	17.9	101.6
PROJ. 1990	2.8	4.7	7.5	- -	0.4	8.0	3.0	4.7	7.7	0.2	2.3	10.2	40.2	44.1	84.3	5.3	19.3	108.8
1995	3.0	5.5	8.5	0.1	0.7	9.3	3.5	5.0	8.5	0.2	2.9	11.6	43.0	46.5	89.4	6.0	22.2	117.6
2000	3.2	5.9	9.1	0.3	0.8	10.2	4.1	5.3	9.4	0.3	3.6	13.3	45.1	49.0	94.1	6.9	26.2	127.2
2005	3.3	6.1	9.4	0.5	1.1	10.9	4.9	5.5	10.4	0.3	4.2	15.0	48.4	51.0	99.5	8.2	30.9	138.5
2010	3.8	6.9	10.8	0.8	1.4	13.0	5.9	5.7	11.6	0.3	5.0	17.0	51.7	54.2	105.9	9.8	36.7	152.4

a) Totals may not sum due to independent rounding. Totals also may not agree with U.S. tables totals due to minor conversion factor differences.
b) Also includes refinery gain and natural gas liquids.
c) Non-U.S. renewables/other consists of hydroelectric power only.
d) Includes U.S. territories.

TABLE 2-4: REFERENCE CASE--ENERGY SUPPLIED TO THE FREE WORLD[a]
(Million Barrels per Day of Oil Equivalent)

YEAR	LIQUIDS[b] (Excludes Coal Liquids)							GAS (Excludes Synthetics)							COAL[c]						
	OECD				REST OF FREE WORLD	NET CPE EXPTS.[f]	TOTAL	OECD				REST OF FREE WORLD	NET CPE EXPTS.[f]	TOTAL	OECD				REST OF FREE WORLD	NET CPE EXPTS.[f]	TOTAL
	U.S.[e]	OTHER	SUB-TOTAL	OPEC				U.S.	OTHER	SUB-TOTAL	OPEC				U.S.	OTHER	SUB-TOTAL	OPEC			
HIST.																					
1970	11.5	3.0	14.5	23.3	2.0	0.8	40.7	9.9	1.9	11.8	0.8	0.9	0.1	13.5	6.9	5.9	12.8	- -	2.0	0.3	15.1
1975	10.5	3.5	14.0	28.1	3.7	1.1	46.9	9.1	3.9	13.0	1.4	1.1	0.1	15.6	6.9	5.2	12.1	- -	2.2	0.4	14.7
1980	10.7	4.1	14.8	27.8	5.7	1.2	49.5	9.1	4.9	14.0	1.6	2.0	0.4	18.1	8.5	5.8	14.3	- -	3.0	0.5	17.8
1985	11.2	6.5	17.7	17.4	9.0	2.0	46.2	8.0	4.6	12.6	2.5	1.9	0.5	17.5	9.1	6.3	15.4	- -	4.6	0.5	20.5
ESTI.																					
1986	10.9	6.6	17.5	19.7	9.1	2.1	48.5	7.8	4.6	12.4	2.6	1.9	0.5	17.4	9.2	6.3	15.5	- -	4.7	0.5	20.7
PROJ.																					
1990	10.1	6.5	16.7	22.7	9.2	1.2	49.8	8.1	5.5	13.6	2.5	2.7	0.5	19.2	10.1	6.1	16.2	- -	5.1	0.5	21.8
1995	8.7	6.3	15.0	27.3	9.1	0.5	51.9	8.3	5.7	14.0	3.4	2.8	0.8	21.0	11.6	6.1	17.6	- -	5.6	0.6	23.8
2000	7.8	5.9	13.7	31.0	9.2	- -	53.9	7.5	5.8	13.4	5.2	3.0	1.3	22.8	13.3	6.6	19.9	- -	6.5	0.7	27.1
2005	7.4	5.7	13.1	33.0	9.1	- -	55.2	7.0	5.5	12.5	7.3	3.4	1.7	25.0	16.2	7.8	23.9	- -	7.9	0.7	32.5
2010	6.8	5.8	12.6	33.6	9.9	- -	56.2	6.8	4.9	11.6	8.7	4.4	1.8	26.5	18.7	10.0	28.7	- -	10.4	0.7	39.8

YEAR	NUCLEAR						RENEWABLES/OTHER[d]						TOTAL PRIMARY						
	OECD				REST OF FREE WORLD	TOTAL	OECD				REST OF FREE WORLD	TOTAL	OECD				REST OF FREE WORLD	NET CPE EXPTS.[f]	TOTAL
	U.S.	OTHER	SUB-TOTAL	OPEC			U.S.	OTHER	SUB-TOTAL	OPEC			U.S.	OTHER	SUB-TOTAL	OPEC			
HIST.																			
1970	0.1	0.2	0.4	- -	- -	0.5	1.9	2.7	4.6	- -	0.6	5.2	30.3	13.7	44.0	24.1	5.5	1.2	74.8
1975	0.9	0.7	1.6	- -	0.1	1.7	2.3	3.2	5.6	- -	0.9	6.5	29.7	16.5	46.2	29.5	8.0	1.6	85.3
1980	1.3	1.7	3.0	- -	0.1	3.0	2.6	3.7	6.4	0.1	1.5	8.0	32.2	20.2	52.4	29.5	12.3	2.1	96.3
1985	2.0	3.9	5.9	- -	0.3	6.3	2.8	4.2	7.0	0.2	2.0	9.2	33.1	25.5	58.6	20.1	17.8	3.0	99.4
ESTI.																			
1986	2.1	4.3	6.4	- -	0.4	6.8	2.9	4.2	7.1	0.2	2.1	9.4	32.9	26.0	59.0	22.5	18.2	3.1	102.6
PROJ.																			
1990	2.8	4.7	7.5	- -	0.4	8.0	3.0	4.7	7.7	0.2	2.3	10.2	34.1	27.5	61.6	25.4	19.7	2.2	108.8
1995	3.0	5.5	8.5	0.1	0.7	9.3	3.5	5.0	8.5	0.2	2.9	11.6	35.1	28.6	63.7	31.0	21.1	1.9	117.7
2000	3.2	5.9	9.1	0.3	0.8	10.2	4.1	5.3	9.4	0.3	3.6	13.3	35.9	29.6	65.5	36.7	23.1	2.0	127.2
2005	3.3	6.1	9.4	0.5	1.1	10.9	4.9	5.5	10.4	0.3	4.2	15.0	38.8	30.6	69.4	41.0	25.8	2.4	138.6
2010	3.8	6.9	10.8	0.8	1.4	13.0	5.9	5.7	11.6	0.3	5.0	17.0	42.0	33.3	75.3	43.5	31.1	2.6	152.4

a) Supply from each region includes production, stock changes and adjustments. Totals may not add due to independent rounding. Totals also may not agree with U.S. tables totals due to minor conversion factor differences.
b) Includes heavy oil, tar sands, enhanced oil recovery, shale oil and natural gas liquids. Units are physical barrels.
c) Includes coal production for synthetics.
d) Non-U.S. renewables/other consists of hydroelectric power only.
e) Includes about 0.5 MMBD of refinery gain (see Table 3-10), and excludes U.S. territories which are included as part of the other OECD.
f) Net exports from Centrally Planned Economies.

TABLE 2-5: REFERENCE CASE--NET ENERGY TRADE[a]
(Million Barrels per Day of Oil-Equivalent)

YEAR	NET OIL EXPORTS						NET GAS EXPORTS					
	OECD			OPEC	REST OF FREE WORLD	CENTRALLY PLANNED ECONOMIES	OECD			OPEC	REST OF FREE WORLD	CENTRALLY PLANNED ECONOMIES
	U.S.	OTHER[b]	SUBTOTAL				U.S.	OTHER[b]	SUBTOTAL			
HIST. 1970	-3.2	-16.9	-20.1	22.0	-2.8	0.8	-0.4	- -	-0.4	0.1	0.3	0.1
1975	-5.8	-17.7	-23.5	25.9	-3.5	1.1	-0.4	- -	-0.4	0.5	-0.2	0.1
1980	-6.4	-17.3	-23.7	25.1	-2.6	1.2	-0.4	-0.7	-1.1	0.4	0.2	0.5
1985	-4.3	-11.7	-16.0	13.8	0.1	2.0	-0.4	-1.4	-1.7	1.1	-0.1	0.5
ESTI. 1986	-5.4	-12.2	-17.6	16.1	0.2	2.1	-0.3	-1.4	-1.7	1.1	- -	0.5
PROJ. 1990	-6.9	-13.7	-20.6	19.2	- -	1.2	-0.5	-1.0	-1.5	0.9	0.1	0.5
1995	-8.3	-14.3	-22.7	23.5	-1.5	0.5	-0.9	-1.5	-2.4	1.6	- -	0.8
2000	-9.1	-14.8	-23.9	26.8	-3.0	- -	-1.5	-2.5	-4.0	3.0	-0.4	1.3
2005	-9.4	-14.6	-24.0	28.4	-4.6	- -	-1.8	-3.7	-5.5	4.5	-0.8	1.7
2010	-9.9	-13.7	-23.6	28.8	-5.3	- -	-1.7	-4.9	-6.6	5.2	-0.6	1.8

YEAR	NET COAL EXPORTS						NET ENERGY TRADE[c]					
	OECD			OPEC	REST OF FREE WORLD	CENTRALLY PLANNED ECONOMIES	OECD			OPEC	REST OF FREE WORLD	CENTRALLY PLANNED ECONOMIES
	U.S.	OTHER[b]	SUBTOTAL				U.S.	OTHER[b]	SUBTOTAL			
HIST. 1970	0.9	-1.3	-0.3	- -	- -	0.3	-2.7	-18.1	-20.8	22.1	-2.5	1.2
1975	0.9	-1.2	-0.3	- -	-0.1	0.4	-5.4	-18.9	-24.3	26.4	-3.7	1.6
1980	1.1	-1.7	-0.5	- -	- -	0.5	-5.6	-19.6	-25.2	25.5	-2.4	2.2
1985	1.0	-1.3	-0.3	- -	0.2	0.5	-3.7	-14.4	-18.1	14.9	0.2	3.0
ESTI. 1986	1.0	-1.4	-0.3	- -	0.1	0.5	-4.7	-15.0	-19.6	17.2	0.2	3.1
PROJ. 1990	1.2	-1.9	-0.7	- -	0.2	0.5	-6.2	-16.6	-22.8	20.1	0.3	2.2
1995	1.2	-2.1	-0.8	- -	0.3	0.6	-8.0	-17.9	-25.9	25.0	-1.2	1.9
2000	1.4	-2.2	-0.9	- -	0.2	0.7	-9.2	-19.5	-28.7	29.8	-3.2	2.0
2005	1.5	-2.3	-0.8	- -	0.2	0.7	-9.8	-20.6	-30.3	32.8	-5.2	2.4
2010	1.8	-2.5	-0.7	- -	0.1	0.7	-9.8	-21.1	-30.9	34.0	-5.7	2.6

a) Totals may not sum due to independent rounding. Totals also may not agree with U.S. tables totals due to minor conversion factor differences.
b) Includes U.S. territories.
c) Includes liquids, gas and coal trade only.

TABLE 2-6: REFERENCE CASE--LIQUIDS CONSUMED BY AND SUPPLIED TO THE FREE WORLD[a]
(Million Barrels per Day)

YEAR	LIQUIDS CONSUMED								
	OECD								
	U.S.	CANADA	WESTERN EUROPE	JAPAN	OTHER[b]	SUB-TOTAL	OPEC	REST OF FREE WORLD	TOTAL
HIST. 1970	14.7	1.5	12.2	3.8	0.8	33.1	1.3	4.8	39.2
1975	16.3	1.7	12.4	4.5	0.9	35.8	2.2	7.2	45.2
1980	17.1	1.9	13.5	5.0	1.2	38.7	2.7	8.3	49.7
1985	15.7	1.5	11.7	4.3	1.0	34.2	3.6	8.9	46.7
ESTI. 1986	16.2	1.5	11.9	4.4	1.0	35.0	3.6	8.9	47.6
PROJ. 1990	16.9	1.6	12.8	4.7	1.1	37.1	3.5	9.3	49.8
1995	17.0	1.7	13.0	4.8	1.1	37.6	3.8	10.6	52.0
2000	16.9	1.7	13.1	4.8	1.1	37.6	4.2	12.2	54.1
2005	16.8	1.7	12.8	4.7	1.1	37.0	4.6	13.7	55.4
2010	16.7	1.6	12.3	4.6	1.0	36.2	5.0	15.2	56.4

YEAR	LIQUIDS SUPPLIED									
	OIL PRODUCTION[c] (Excludes Coal Liquids)									
	NON-OPEC									
	U.S.[d]	NON-U.S. OECD[e]	REST OF FREE WORLD	SUB-TOTAL	OPEC	TOTAL	COAL LIQUIDS	STOCK CHANGES AND OTHER ADJUST.[f]	NET CPE OIL EXPTS.[g]	TOTAL
HIST. 1970	11.7	1.8	2.0	15.5	23.3	38.8	- -	1.1	0.8	40.7
1975	10.5	2.9	3.5	16.9	28.1	45.0	- -	0.8	1.1	46.9
1980	10.8	4.9	5.8	21.5	27.8	49.3	- -	-1.0	1.2	49.5
1985	11.2	6.5	9.0	26.7	17.4	44.2	- -	- -	2.0	46.7
ESTI. 1986	10.9	6.6	9.1	26.6	19.7	46.4	- -	- -	2.1	47.6
PROJ. 1990	10.1	6.5	9.2	25.9	22.7	48.5	- -	- -	1.2	49.8
1995	8.7	6.3	9.1	24.1	27.3	51.9	- -	- -	- -	52.0
2000	7.8	5.9	9.2	22.9	31.0	53.9	0.1	- -	- -	54.1
2005	7.4	5.7	9.1	22.2	33.0	55.2	0.2	- -	- -	55.4
2010	6.8	5.8	9.9	22.5	33.6	56.2	0.3	- -	- -	56.4

a) Totals may not add due to independent rounding.
b) Includes U.S. territories, Australia and New Zealand.
c) Includes heavy oil, tar sands, enhanced oil recovery, shale oil and natural gas liquids.
d) Includes about 0.5 MMBD of refinery gain (see Table 3-10).
e) Includes U.S. territories.
f) Negative numbers indicate a reduction in supply, positive numbers an addition to supply. Adjustments are a balancing item and include unaccounted for private stock changes, *losses, gains, miscellaneous blending components and unaccounted for supply.*
g) Net oil exports from Centrally Planned Economies.

TABLE 3-1: REFERENCE CASE--KEY U.S. DATA AND ASSUMPTIONS

YEAR	WORLD OIL PRICE[a] ($1986 PER BARREL)	GROSS NATIONAL PRODUCT (BILLION $1986)	GROSS NATIONAL PRODUCT DEFLATOR (1986=1.00)
HIST.			
1960	8.97	1907	0.289
1965	8.61	2391	0.314
1970	8.25	2766	0.386
1975	26.01	3086	0.531
1980	45.34	3649	0.753
1981	45.12	3719	0.825
1982	38.41	3625	0.875
1983	32.29	3754	0.909
1984	30.65	3996	0.943
1985	27.76	4104	0.974
ESTI.			
1986	13.98	4210	1.000
PROJ.			
1990	20.32	4826	- -
1995	26.32	5583	- -
2000	33.09	6298	- -
2005	42.10	7126	- -
2010	52.70	8002	- -

DOMESTIC POLICIES

- o Comprehensive decontrol of the natural gas market in accordance with current administration policy
- o No major changes in current environmental regulations
- o Changes to tax incentives provided under the Tax Reform Act of 1986
- o Increased rates of leasing Federal lands for energy development
- o A focus of Federal R&D efforts on long-term development and away from commercialization

ECONOMICALLY RECOVERABLE RESOURCES[b]

	DISCOVERED[c]	UNDISCOVERED[d]	TOTAL
CRUDE OIL (Billion Barrels)	27	77	105
NATURAL GAS (Trillion Cu. Ft.)	192	588	780
COAL (Billion Tons)	478	- -	- -

a) Refiner acquisition costs of crude oil imports.
b) Discovered oil and gas resources as of 1986. Undiscovered oil and gas onshore and non-federal offshore resources as of 1980. Undiscovered federal offshore oil and gas resources as of 1984. Discovered coal resources includes measured and indicated resources representing all coal in place.
c) Excludes resources already recovered. Also excludes natural gas liquids (NGL) estimated at about 8.2 billion barrels in 1986.

TABLE 3-2: REFERENCE CASE--GROWTH RATES OF INTEREST

PERIOD	REAL GROWTH RATE (Percent per year)			
	WORLD OIL PRICE	U.S. ECONOMIC GROWTH	U.S. PRIMARY ENERGY CONSUMPTION	U.S. ELECTRICITY CONSUMPTION
1960-1970	-0.8	3.9	4.1	6.9
1970-1980	17.0	3.1	1.4	4.1
1980-1986	-19.6	2.3	-0.3	2.0
1986-1990	9.4	3.4	2.0	2.1
1990-2000	4.9	2.7	1.2	2.5
2000-2010	4.7	2.4	1.4	2.5
1986-2000	6.2	2.9	1.5	2.4
1986-2010	5.5	2.7	1.4	2.4

TABLE 3-3: REFERENCE CASE--U.S. FUEL PRICE SUMMARY BY SECTOR
(1986 DOLLARS PER MILLION BTU)

YEAR	WORLD OIL PRICE[b] (1986$ /BBL)	RESOURCE PRICES			DELIVERED PRICES																	
					RESIDENTIAL SECTOR				COMMERCIAL SECTOR					INDUSTRIAL SECTOR						TRANSPORTATION SECTOR			
		REFINER CRUDE COST	WELLHEAD GAS PRICE	MINE-MOUTH COAL PRICE	DISTILLATE	LIQUID GASES	NATURAL GAS	ELECTRICITY	DISTILLATE	RESID. FUEL OIL	LIQUID GASES	NATURAL GAS	ELECTRICITY	DISTILLATE	RESID. FUEL OIL	LIQUID GASES	NATURAL GAS	COAL	ELECTRICITY	GASOLINE	DIESEL	RESID. FUEL OIL	JET FUEL
HIST. 1960	8.97	1.55	0.25	0.69	3.80	3.73	3.52	25.00	3.25	2.13	3.67	2.59	24.09	3.35	2.11	3.31	0.91	0.97	9.78	8.60	3.80	1.65	6.56
1965	8.61	1.48	0.34	0.60	3.60	3.30	3.23	21.02	3.09	1.75	3.21	2.39	19.38	3.10	1.75	2.87	0.86	0.86	8.36	7.93	3.60	1.38	3.60
1970	8.25	1.42	0.56	0.69	3.44	5.43	2.75	16.96	2.86	1.30	3.31	1.95	15.99	1.89	1.19	2.90	0.86	1.14	7.79	7.40	3.35	0.93	2.02
1975	26.01	4.49	1.03	1.54	5.17	7.58	3.15	19.43	4.66	3.82	5.04	2.49	19.32	4.22	3.64	4.83	1.62	2.78	11.41	8.75	5.69	2.73	4.11
1980	45.34	7.79	2.31	1.38	9.36	10.51	4.78	20.92	8.68	5.91	6.88	4.40	21.62	7.49	4.94	6.99	3.14	2.35	14.41	12.97	9.47	4.23	9.02
1985	27.76	4.74	2.47	1.18	7.74	7.84	6.08	21.41	6.14	4.21	6.31	5.45	21.73	6.13	3.98	6.50	3.96	1.87	18.95	9.23	8.60	4.09	6.11
ESTI. 1986	13.98	2.49	1.81	1.16	4.46	4.55	5.57	20.34	3.62	2.53	4.32	4.94	20.56	3.61	2.15	3.84	3.07	1.85	17.93	5.67	4.91	2.03	3.91
PROJ. 1990	20.32	3.50	2.32	1.19	5.93	5.22	5.35	21.47	5.29	3.59	4.86	4.87	21.37	4.47	3.28	4.86	3.65	1.90	17.37	7.80	6.41	2.64	4.62
1995	26.32	4.54	3.51	1.34	7.13	6.25	6.63	22.58	6.47	4.48	5.93	6.16	22.42	5.75	4.23	5.93	4.91	2.09	18.51	9.26	7.61	3.48	5.95
2000	33.09	5.70	4.78	1.54	8.48	7.41	8.00	23.27	7.80	5.49	7.14	7.52	23.12	7.18	5.29	7.14	6.25	2.33	19.24	10.28	8.96	4.42	7.46
2005	42.10	7.26	5.77	1.63	10.27	8.96	9.08	23.57	9.56	6.83	8.75	8.60	23.44	9.09	6.71	8.75	7.31	2.45	19.66	11.81	10.75	5.68	9.46
2010	52.70	9.09	7.81	1.70	12.39	10.78	11.28	23.52	11.64	8.41	10.65	10.80	23.41	11.33	8.38	10.65	9.48	2.57	19.55	13.88	12.86	7.16	11.82

PHYSICAL UNITS

YEAR	PER BBL	PER BBL	PER MCF	PER TON	PER GAL	PER GAL	PER MCF	PER KWH	PER GAL	PER BBL	PER GAL	PER MCF	PER KWH	PER GAL	PER BBL	PER GAL	PER MCF	PER TON	PER KWH	PER GAL	PER GAL	PER BBL	PER GAL
ESTI. 1986	13.98	14.55	1.87	25.46	0.62	0.43	5.82	0.069	0.50	15.91	0.41	5.10	0.070	0.50	13.52	0.36	3.18	37.73	0.061	0.93	0.68	12.77	0.53
PROJ. 1990	20.32	20.32	2.38	26.27	0.82	0.49	5.47	0.073	0.73	22.57	0.46	4.99	0.073	0.62	20.63	0.46	3.73	46.06	0.059	0.98	0.89	16.62	0.62
1995	26.32	26.32	3.60	29.70	0.99	0.59	6.79	0.077	0.90	28.18	0.56	6.30	0.076	0.80	26.57	0.56	5.03	50.65	0.063	1.16	1.06	21.88	0.80
2000	33.09	33.09	4.90	34.15	1.18	0.70	8.19	0.079	1.08	34.52	0.67	7.70	0.079	1.00	33.26	0.67	6.40	56.42	0.066	1.29	1.24	27.82	1.01
2005	42.10	42.10	5.92	36.03	1.43	0.85	9.30	0.080	1.33	42.95	0.83	8.80	0.080	1.26	42.19	0.83	7.49	59.46	0.067	1.48	1.49	35.72	1.28
2010	52.70	52.70	8.02	37.70	1.72	1.02	11.55	0.080	1.61	52.88	1.01	11.06	0.080	1.57	52.68	1.01	9.67	62.32	0.067	1.74	1.78	45.01	1.60

a) Projected delivered prices are resource prices plus estimated markups for processing and distribution.
b) U. S. average refiner aquisition cost of imported crude oil.

TABLE 3-4: REFERENCE CASE--PRIMARY ENERGY SUPPLIED TO THE U.S. ECONOMY
(QUADS)

YEAR	INDIGENOUS ENERGY PRODUCTION						NET IMPORTS[a]					ADJUSTMENTS[b]					PRIMARY ENERGY SUPPLIED TO U.S. ECONOMY TOTAL
												STOCK CHANGES					
	OIL	GAS	COAL	NUCLEAR	RENEW-ABLE	TOTAL	OIL	GAS[c]	COAL	OTHER[d]	TOTAL	OIL	GAS	COAL	OTHER[e]	TOTAL	
HIST. 1960	16.4	12.7	10.8	- -	3.0	42.9	3.6	0.1	-1.0	- -	2.7	0.1	-0.1	0.1	-0.6	-0.5	45.1
1965	18.4	15.8	13.1	- -	3.4	50.7	5.0	0.4	-1.4	- -	4.0	- -	-0.1	- -	-0.6	-0.7	54.0
1970	22.9	21.7	14.6	0.2	4.1	63.5	6.9	0.8	-1.9	- -	5.8	-0.2	-0.4	-0.3	-0.3	-1.2	68.1
1975	20.1	19.6	15.0	1.9	4.8	61.4	12.5	0.9	-1.7	0.1	11.8	-0.1	-0.3	-0.7	0.1	-1.0	72.2
1980	20.5	19.9	18.6	2.7	5.3	67.0	13.5	1.0	-2.4	0.1	12.2	-0.3	- -	-0.5	-0.3	-1.2	78.0
1985	21.2	16.9	19.3	4.2	5.9	67.4	9.0	0.9	-2.4	0.1	7.6	0.2	0.2	0.6	0.2	1.2	76.2
ESTI. 1986	20.5	16.6	19.5	4.5	6.1	67.1	11.5	0.7	-2.2	0.1	10.1	-0.4	-0.1	-0.1	0.1	-0.6	76.7
PROJ. 1990	18.9	17.2	21.3	6.0	6.4	69.7	14.8	0.9	-2.5	0.2	13.4	- -	- -	- -	- -	- -	83.1
1995	15.9	17.5	24.5	6.4	7.5	71.8	17.9	1.8	-2.6	0.2	17.4	- -	- -	- -	- -	- -	89.2
2000	14.2	15.9	28.2	6.7	8.9	73.9	19.7	3.0	-2.9	0.2	20.1	- -	- -	- -	- -	- -	94.0
2005	13.5	14.8	34.2	6.9	10.3	79.8	20.3	3.8	-3.1	0.3	21.2	- -	- -	- -	- -	- -	101.0
2010	12.3	13.5	39.6	8.1	12.7	86.1	21.3	4.2	-3.6	0.3	22.2	- -	- -	- -	- -	- -	108.2

PHYSICAL UNITS

YEAR	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	MILLION BDOE	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	MILLION BDOE	MILLION BDOE	MILLION BDOE
ESTI. 1986	10.3	16.0	898	384	2.9	31.8	5.4	0.7	-83	0.1	3.6	-0.2	-0.1	-8	- -	0.6	36.0
PROJ. 1990	9.5	16.6	983	561	3.0	32.9	6.9	0.9	-96	0.1	6.3	- -	- -	- -	- -	- -	39.2
1995	8.1	17.0	1133	602	3.6	33.9	8.3	1.8	-99	0.1	8.2	- -	- -	- -	- -	- -	42.1
2000	7.2	15.4	1310	632	4.2	34.9	9.1	2.9	-110	0.1	9.5	- -	- -	- -	- -	- -	44.4
2005	6.9	14.4	1587	650	4.9	37.7	9.4	3.6	-118	0.1	10.0	- -	- -	- -	- -	- -	47.7
2010	6.3	13.0	1833	764	6.0	40.7	9.9	4.0	-135	0.1	10.5	- -	- -	- -	- -	- -	51.1

a) Including Strategic Petroleum Reserve.
b) Negative numbers indicate a reduction in energy supplied and positive numbers indicate an increase in energy supplied to the economy.
c) Includes pipeline gas and liquified natural gas (LNG).
d) Includes small amounts of coal coke and electricity.
e) A balancing item. Includes unaccounted for oil, gas and coal private stock changes, losses, gains, miscellaneous blending components, unaccounted for supply and anthracite shipped overseas to U.S. Armed Forces.

TABLE 3-5: REFERENCE CASE--ENERGY CONSUMED BY THE U.S. ECONOMY
(QUADS)

YEAR	PRIMARY ENERGY CONSUMED BY U.S. ECONOMY							ENERGY TRANSFORMATION AND DISTRIBUTION LOSSES TOTAL	ENERGY USED BY FINAL CONSUMERS EXCLUDING INPUTS TO UTILITIES AND SYNTHETICS								
	OIL	GAS	COAL	NUCLEAR	RENEWABLE	NET ELECTRICITY IMPORTS	TOTAL		LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY	RENEWABLE[a]	TOTAL	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	TRANSPORTATION
HIST.																		
1960	19.9	12.4	9.8	- -	3.0	- -	45.1	-5.9	19.3	10.6	5.6	2.4	1.3	39.2	7.2	3.5	18.1	10.6
1965	23.2	15.8	11.6	- -	3.4	- -	54.0	-7.7	22.6	13.4	5.8	3.3	1.3	46.4	8.3	4.2	21.7	12.4
1970	29.5	21.8	12.3	0.2	4.1	- -	68.0	-11.6	27.4	17.7	5.1	4.8	1.4	56.4	10.0	5.6	25.0	16.0
1975	32.7	19.9	12.7	1.9	4.8	- -	72.1	-14.4	29.5	16.7	3.9	6.0	1.6	57.7	10.0	5.6	23.8	18.2
1980	34.2	20.4	15.4	2.7	5.3	0.1	78.1	-17.2	31.6	16.6	3.3	7.2	2.3	60.9	9.9	6.0	25.4	19.7
1985	30.9	17.7	17.5	4.2	5.9	0.1	76.4	-18.5	29.7	14.7	2.9	7.9	2.8	57.9	9.9	6.0	22.1	20.0
ESTI.																		
1986	32.1	16.7	17.3	4.5	6.1	0.1	76.7	-18.7	30.6	14.2	2.7	8.1	2.8	58.4	9.9	6.0	21.6	20.8
PROJ.																		
1990	33.7	18.1	18.8	6.0	6.4	0.2	83.1	-21.5	32.1	15.2	2.5	8.8	2.9	61.6	10.9	6.9	23.4	20.5
1995	33.8	19.3	21.9	6.4	7.5	0.2	89.2	-24.7	32.2	16.2	2.4	10.1	3.4	64.4	11.3	7.5	25.4	20.4
2000	33.9	18.9	25.3	6.7	8.9	0.2	94.0	-27.6	32.5	16.3	2.5	11.3	3.8	66.4	11.5	7.7	26.6	20.6
2005	33.8	18.6	31.1	6.9	10.3	0.3	101.0	-31.3	32.6	16.5	3.2	12.9	4.5	69.7	11.6	8.2	28.8	21.2
2010	33.5	17.6	36.0	8.1	12.7	0.3	108.2	-35.3	32.6	16.3	4.2	14.5	5.4	72.9	11.6	8.8	30.9	21.8

PHYSICAL UNITS

YEAR	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	MILLION BDOE	MILLION BDOE	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BDOE			
ESTI.																		
1986	16.2	16.1	813	2.1	2.9	41	36.2	-8.8	15.5	13.9	117	2351	1.3	27.4	4.7	2.8	10.2	9.8
PROJ.																		
1990	16.9	17.5	888	2.8	3.0	50	39.2	-10.2	16.3	14.7	118	2585	1.4	29.1	5.1	3.3	11.1	9.7
1995	17.0	18.7	1034	3.0	3.6	56	42.1	-11.7	16.3	15.7	114	2974	1.6	30.4	5.4	3.5	12.0	9.6
2000	16.9	18.3	1199	3.2	4.2	67	44.4	-13.0	16.3	15.8	118	3314	1.8	31.4	5.4	3.7	12.6	9.8
2005	16.8	18.0	1469	3.3	4.9	79	47.7	-14.8	16.3	16.0	150	3766	2.1	32.9	5.5	3.9	13.6	10.0
2010	16.7	17.1	1698	3.8	6.0	88	51.1	-16.7	16.3	15.8	191	4237	2.5	34.5	5.5	4.1	14.6	10.3

a) Renewable central electric is included in electricity column.

TABLE 3-6: REFERENCE CASE--ENERGY TRANSFORMATION IN THE U.S. ECONOMY
(QUADS)

	ELECTRIC UTILITIES									SYNTHETIC FUELS								
	ENERGY INPUT						ENERGY TRANS-FOR-MATION/ DISTRI-BUTION LOSSES[b]	NET ELEC-TRICITY IMPORTS	SALES	ENERGY INPUT			TRANS-FOR-MATION LOSSES	SALES				ENERGY TRANS-FOR-MATION/ DISTRI-BUTION LOSSES
										OIL	COAL			LIQUIDS	GASES			
YEAR	OIL[a]	GAS	COAL	NUCLEAR	RENEW-ABLE	TOTAL			TOTAL	FOR SYNTH. GAS	FOR SYNTH. GAS	FOR SYNTH. LIQUIDS	TOTAL		SNG	COAL GAS	TOTAL	TOTAL
HIST.																		
1960	0.6	1.8	4.2	- -	1.7	8.3	-5.9	- -	2.4	- -	- -	- -	- -	- -	- -	- -	- -	-5.9
1965	0.7	2.4	5.8	- -	2.1	11.0	-7.7	- -	3.3	- -	- -	- -	- -	- -	- -	- -	- -	-7.7
1970	2.1	4.1	7.2	0.2	2.7	16.3	-11.6	- -	4.8	- -	- -	- -	- -	- -	- -	- -	- -	-11.5
1975	3.2	3.2	8.8	1.9	3.2	20.3	-14.4	- -	6.0	- -	- -	- -	- -	- -	- -	- -	- -	-14.5
1980	2.6	3.8	12.1	2.7	3.0	24.3	-17.2	0.1	7.2	- -	- -	- -	- -	- -	- -	- -	- -	-17.3
1985	1.1	3.2	14.5	4.2	3.1	26.1	-18.5	0.1	7.9	0.1	- -	- -	- -	- -	0.1	- -	0.1	-18.5
ESTI.																		
1986	1.5	2.7	14.5	4.5	3.3	26.5	-18.6	0.1	8.1	0.1	0.1	- -	-0.1	- -	0.1	0.1	0.1	-18.6
PROJ.																		
1990	1.5	3.0	16.1	6.0	3.5	30.1	-21.5	0.2	8.8	0.1	0.1	- -	- -	- -	0.1	0.1	0.2	-21.5
1995	1.6	3.2	19.3	6.4	4.2	34.6	-24.7	0.2	10.1	- -	0.1	- -	- -	- -	- -	0.1	0.1	-24.7
2000	1.4	2.7	22.6	6.7	5.0	38.5	-27.6	0.2	11.3	- -	0.1	- -	- -	- -	- -	0.1	0.1	-27.6
2005	1.2	2.2	27.6	6.9	5.9	43.8	-31.3	0.3	12.9	- -	0.1	- -	- -	- -	- -	0.1	0.1	-31.3
2010	0.9	1.6	31.4	8.1	7.3	49.2	-35.1	0.3	14.5	- -	0.5	- -	-0.2	- -	- -	0.3	0.3	-35.3

PHYSICAL UNITS

YEAR	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	MILLION BDOE				BILLION KWH		MILLION BPD	MILLION TONS		MILLION BDOE	MILLION BDOE	TRILLION CU. FT.			MILLION BDOE
ESTI.																		
1986	0.7	2.6	691	2.1	1.5	12.3	-8.7	41	2351	0.0	5	- -	- -	- -	0.1	- -	0.1	-8.7
PROJ.																		
1990	0.6	2.9	764	2.8	1.7	14.2	-10.2	50	2585	- -	5	- -	- -	- -	0.1	0.1	0.2	-10.2
1995	0.7	3.1	912	3.0	2.0	16.3	-11.7	56	2974	- -	5	- -	- -	- -	- -	0.1	0.1	-11.7
2000	0.6	2.6	1072	3.2	2.4	18.2	-13.0	67	3314	- -	5	- -	- -	- -	- -	0.1	0.1	-13.0
2005	0.5	2.1	1309	3.3	2.8	20.7	-14.8	79	3766	- -	6	- -	- -	- -	- -	0.1	0.1	-14.8
2010	0.4	1.6	1485	3.8	3.4	23.3	-16.6	88	4237	- -	20	- -	-0.1	- -	- -	0.3	0.3	-16.7

a) Includes petroleum coke.
b) Includes utility own use and transmission losses.

TABLE 3-7: REFERENCE CASE--U.S.ENERGY CONSUMPTION BY THE RESIDENTIAL AND COMMERCIAL SECTORS
(QUADS)

YEAR	RESIDENTIAL AND COMMERCIAL																	
	RESIDENTIAL						COMMERCIAL						RESIDENTIAL AND COMMERCIAL					
	LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY a)	RENEWABLE	TOTAL	LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY a)	RENEWABLE	TOTAL	LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY a)	RENEWABLE	TOTAL
HIST.																		
1960	2.3	3.2	0.4	0.7	0.6	7.2	1.3	1.1	0.6	0.5	- -	3.5	3.6	4.3	1.0	1.2	0.6	10.7
1965	2.5	4.0	0.3	1.0	0.5	8.3	1.5	1.5	0.4	0.8	- -	4.2	4.0	5.5	0.7	1.8	0.5	12.5
1970	2.8	5.0	0.2	1.6	0.4	10.0	1.6	2.5	0.3	1.2	- -	5.6	4.4	7.5	0.5	2.8	0.4	15.6
1975	2.5	5.0	0.1	2.0	0.4	10.0	1.3	2.6	0.1	1.6	- -	5.6	3.8	7.6	0.2	3.6	0.4	15.6
1980	1.7	4.9	0.1	2.5	0.8	9.9	1.3	2.7	0.1	1.9	- -	6.0	3.0	7.5	0.2	4.4	0.8	15.9
1985	1.6	4.5	0.1	2.7	1.0	9.9	1.0	2.5	0.1	2.4	0.1	6.0	2.6	7.1	0.2	5.1	1.0	15.9
ESTI.																		
1986	1.6	4.5	0.1	2.8	1.0	9.9	1.0	2.5	0.1	2.4	0.1	6.0	2.6	6.9	0.2	5.3	1.0	15.9
PROJ.																		
1990	1.6	5.0	0.1	3.1	1.0	10.9	1.3	2.9	0.1	2.5	0.1	6.9	2.9	8.0	0.2	5.6	1.1	17.8
1995	1.5	5.2	0.1	3.4	1.1	11.3	1.4	3.1	0.1	2.8	0.1	7.5	2.8	8.3	0.2	6.3	1.2	18.8
2000	1.3	5.2	0.1	3.8	1.2	11.5	1.3	3.1	0.1	3.1	0.2	7.7	2.7	8.3	0.2	6.8	1.3	19.2
2005	1.2	5.0	0.1	4.2	1.2	11.6	1.3	3.2	0.1	3.4	0.2	8.2	2.5	8.2	0.1	7.6	1.4	19.9
2010	1.0	4.6	0.1	4.6	1.3	11.6	1.3	3.2	0.1	3.8	0.4	8.8	2.3	7.9	0.1	8.4	1.7	20.4

PHYSICAL UNITS

YEAR	RESIDENTIAL						COMMERCIAL						RESIDENTIAL AND COMMERCIAL					
	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE
ESTI.																		
1986	0.8	4.4	3	818	0.5	4.7	0.5	2.4	4	691	- -	2.8	1.3	6.6	7	1539	0.5	7.5
PROJ.																		
1990	0.8	4.9	3	906	0.5	5.1	0.7	2.8	4	735	- -	3.3	1.5	7.7	7	1641	0.5	8.4
1995	0.8	5.1	3	1011	0.5	5.4	0.7	3.0	3	825	0.1	3.5	1.5	8.1	6	1836	0.6	8.9
2000	0.7	5.0	2	1101	0.5	5.4	0.7	3.0	3	898	0.1	3.7	1.4	8.0	5	1999	0.6	9.1
2005	0.6	4.8	2	1222	0.6	5.5	0.7	3.1	3	1009	0.1	3.9	1.3	7.9	5	2231	0.7	9.4
2010	0.5	4.5	2	1343	0.6	5.5	0.7	3.1	2	1113	0.2	4.1	1.2	7.6	4	2456	0.8	9.6

a) Excludes generation, transmission and distribution losses.

TABLE 3-8: REFERENCE CASE--U.S. ENERGY CONSUMPTION BY THE INDUSTRIAL SECTOR
(QUADS)

YEAR	INDUSTRIAL																	
	ENERGY USE (Excluding Non-Energy Feedstocks)[a]						NON-ENERGY USE[b]						ENERGY AND NON-ENERGY USE[a]					
							LIQUIDS											
	LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY[c]	RENEWABLE	TOTAL	ASPHALT	OTHER	TOTAL	GASES	METAL COAL[d]	TOTAL	LIQUIDS	GASES	COAL SOLIDS	ELECTRICITY[c]	RENEWABLE	TOTAL
HIST. 1960	4.0	5.6	2.4	1.1	0.7	13.8	0.7	1.0	1.7	0.4	2.2	2.2	5.7	6.0	4.6	1.1	0.7	18.1
1965	4.4	7.0	2.6	1.5	0.9	16.4	0.9	1.5	2.4	0.3	2.6	2.8	6.8	7.3	5.2	1.5	0.9	21.7
1970	4.7	8.8	2.1	2.0	1.0	18.6	1.1	2.0	3.1	0.7	2.6	3.9	7.8	9.5	4.7	2.0	1.0	25.0
1975	4.8	7.8	1.4	2.4	1.1	17.6	1.1	2.3	3.4	0.7	2.2	4.2	8.2	8.5	3.6	2.4	1.1	23.8
1980	5.3	7.8	1.4	2.8	1.4	18.8	1.0	3.1	4.1	0.6	1.8	4.9	9.5	8.4	3.2	2.8	1.4	25.4
1985	3.8	6.4	1.7	2.9	1.7	16.4	1.0	2.9	3.9	0.7	1.1	5.7	7.7	7.1	2.8	2.9	1.7	22.1
ESTI. 1986	4.0	6.0	1.5	2.8	1.7	16.0	1.1	2.8	3.9	0.7	1.1	5.7	7.9	6.7	2.5	2.8	1.7	21.6
PROJ. 1990	5.6	6.0	1.4	3.3	1.7	18.0	1.0	2.7	3.7	0.8	1.0	5.5	9.3	6.8	2.4	3.3	1.7	23.4
1995	5.7	6.5	1.4	3.9	2.1	19.6	1.1	2.9	4.0	0.9	0.9	5.8	9.7	7.4	2.3	3.9	2.1	25.4
2000	5.6	6.6	1.6	4.5	2.4	20.7	1.1	3.1	4.2	0.9	0.7	5.9	9.8	7.5	2.4	4.5	2.4	26.6
2005	5.2	6.8	2.4	5.3	2.7	22.4	1.2	3.5	4.6	1.1	0.7	6.4	9.8	7.8	3.1	5.3	2.7	28.8
2010	4.9	6.7	3.4	6.2	3.1	24.2	1.2	3.6	4.8	1.2	0.7	6.7	9.7	7.9	4.0	6.2	3.1	30.9

PHYSICAL UNITS

YEAR	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE	MILLION BPD			TRILL'N CU. FT.	MILLION TONS	MILLION BDOE	MILLION BPD	TRILL'N CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE
ESTI. 1986	2.0	5.9	64	808	0.8	7.5	0.5	1.5	1.9	0.7	44	2.7	4.1	6.5	105	808	0.8	10.2
PROJ. 1990	2.9	5.8	59	956	0.8	8.5	0.4	1.4	1.8	0.8	43	2.6	4.8	6.6	102	956	0.8	11.1
1995	2.9	6.3	58	1151	1.0	9.3	0.4	1.5	1.9	0.9	39	2.7	5.0	7.2	97	1151	1.0	12.0
2000	2.9	6.4	69	1331	1.1	9.8	0.5	1.6	2.1	0.9	31	2.8	5.1	7.3	100	1331	1.1	12.6
2005	2.7	6.5	101	1555	1.3	10.6	0.5	1.8	2.3	1.0	30	3.0	5.1	7.6	131	1555	1.3	13.6
2010	2.5	6.5	143	1803	1.5	11.4	0.5	1.9	2.4	1.1	28	3.1	5.0	7.7	171	1803	1.5	14.6

a) Excludes synthetic fuels inputs.
b) Energy resources utilized in the manufacture of non-energy materials (asphalt, fertilizers, etc.).
c) Excludes generation, transmission and distribution losses.
d) Metallurgical coal.

TABLE 3-9: REFERENCE CASE--U.S. ENERGY CONSUMPTION BY THE TRANSPORTATION SECTOR
(QUADS)

	TRANSPORTATION									
	LIQUIDS									
YEAR	GASOLINE	DIESEL	JETFUEL	OTHER[a]	TOTAL	GASES	SOLIDS	ELECTRICITY[b]	RENEWABLE	TOTAL
HIST. 1960	7.5	0.9	0.7	1.0	10.1	0.4	0.1	- -	- -	10.6
1965	8.6	1.1	1.2	1.0	11.9	0.5	- -	- -	- -	12.4
1970	10.8	1.6	2.0	0.9	15.3	0.7	- -	- -	- -	16.0
1975	12.6	2.1	2.0	0.9	17.6	0.6	- -	- -	- -	18.2
1980	12.4	2.8	2.2	1.6	19.0	0.6	- -	- -	- -	19.7
1985	12.8	3.2	2.5	1.0	19.5	0.5	- -	- -	- -	20.0
ESTI. 1986	13.3	3.3	2.7	1.1	20.2	0.5	- -	- -	- -	20.8
PROJ. 1990	12.8	3.5	2.5	1.1	19.8	0.5	- -	- -	0.1	20.5
1995	12.4	3.6	2.5	1.2	19.8	0.5	- -	- -	0.1	20.4
2000	12.4	3.8	2.6	1.2	20.0	0.5	- -	- -	0.2	20.6
2005	12.4	3.9	2.7	1.2	20.3	0.5	- -	- -	0.3	21.2
2010	12.5	4.2	2.8	1.2	20.7	0.5	- -	- -	0.6	21.8

PHYSICAL UNITS

YEAR	MILLION BPD	MILLION BPD	MILLION BPD	MILLION BPD	MILLION BPD	TRILLION CU. FT.	MILLION TONS	BILLION KWH	MILLION BDOE	MILLION BDOE
ESTI. 1986	6.9	1.5	1.3	0.5	10.2	0.5	- -	4	- -	9.8
PROJ. 1990	6.7	1.6	1.2	0.6	10.1	0.5	- -	4	- -	9.7
1995	6.5	1.7	1.2	0.6	10.0	0.5	- -	4	- -	9.6
2000	6.5	1.8	1.3	0.6	10.1	0.5	- -	4	0.1	9.8
2005	6.5	1.8	1.3	0.6	10.3	0.5	- -	5	0.2	10.0
2010	6.5	2.0	1.4	0.6	10.4	0.5	- -	6	0.3	10.3

a) Includes residual fuel, lubricants and waxes.
b) Excludes generation, transmission and distribution losses.

TABLE 3-10: REFERENCE CASE--U.S. LIQUIDS SUPPLY AND TRANSFORMATION
(QUADS)

YEAR	INDIGENOUS OIL PRODUCTION						ADDITIONAL SOURCES			PRIMARY OIL TOTAL	TRANSFORMATION			LIQUIDS USED BY FINAL CONSUMER TOTAL	TOTAL LIQUIDS SUPPLIED TO U.S. ECONOMY[c]
	CONVENTIONAL OIL		ENHANCED OIL RECOVERY	SHALE OIL	NATURAL GAS LIQUIDS	TOTAL	NET IMPORTS	STOCK CHANGES	OTHER[b]		TO ELEC-TRICITY	SYNTHETICS			
	CONTINENTAL U.S.[a]	ALASKA										TO GAS	FROM COAL		
HIST. 1960	14.9	- -	- -	- -	1.5	16.4	3.6	0.1	-0.2	19.9	-0.6	- -	- -	19.3	19.9
1965	16.5	0.1	- -	- -	1.9	18.4	5.0	- -	-0.2	23.2	-0.7	- -	- -	22.6	23.2
1970	19.9	0.5	- -	- -	2.5	22.9	6.9	-0.2	-0.1	29.5	-2.1	- -	- -	27.4	29.5
1975	17.3	0.4	- -	- -	2.4	20.1	12.5	-0.1	0.3	32.7	-3.2	- -	- -	29.5	32.7
1980	14.0	3.4	0.8	- -	2.3	20.5	13.5	-0.3	0.5	34.2	-2.6	- -	- -	31.6	34.2
1985	14.2	3.9	1.0	- -	2.2	21.2	9.0	0.2	0.5	30.9	-1.1	-0.1	- -	29.7	30.9
ESTI. 1986	13.3	4.0	1.0	- -	2.1	20.5	11.5	-0.4	0.5	32.1	-1.5	-0.1	- -	30.5	32.1
PROJ. 1990	11.8	3.7	1.1	- -	2.3	18.9	14.8	- -	- -	33.7	-1.5	-0.1	- -	32.1	33.7
1995	9.3	2.5	1.8	- -	2.3	15.9	17.9	- -	- -	33.8	-1.6	- -	- -	32.2	33.8
2000	8.1	1.9	2.1	- -	2.1	14.2	19.7	- -	- -	33.9	-1.4	- -	- -	32.5	33.9
2005	7.3	1.5	2.7	- -	2.0	13.5	20.3	- -	- -	33.8	-1.2	- -	- -	32.6	33.8
2010	6.1	1.1	3.2	- -	1.9	12.3	21.3	- -	- -	33.5	-0.9	- -	- -	32.6	33.5

PHYSICAL UNITS

YEAR	MILLION BPD														MMBPD
ESTI. 1986	6.3	1.9	0.5	- -	1.5	10.3	5.4	-0.2	0.8	16.2	-0.7	- -	- -	15.5	16.2
PROJ. 1990	5.6	1.7	0.5	- -	1.6	9.5	6.9	- -	0.6	16.9	-0.6	- -	- -	16.3	16.9
1995	4.4	1.2	0.8	- -	1.6	8.1	8.3	- -	0.6	17.0	-0.7	- -	- -	16.3	17.0
2000	3.8	0.9	1.0	- -	1.5	7.2	9.1	- -	0.6	16.9	-0.6	- -	- -	16.3	16.9
2005	3.4	0.7	1.3	- -	1.4	6.9	9.4	- -	0.6	16.8	-0.5	- -	- -	16.3	16.8
2010	2.9	0.5	1.5	- -	1.3	6.3	9.9	- -	0.5	16.7	-0.4	- -	- -	16.3	16.7

a) Includes South Alaskan oil.
b) A balancing item. Includes unaccounted for private stock changes, losses, gains, miscellaneous blending components and unaccounted for supply. Accounts for refinery gains only in the physical units table, 1990-2010.
c) Primary oil plus synthetic oil from coal. Includes oil used to produce electricity and synthetic gas.

TABLE 3-11: REFERENCE CASE--U.S. GASES SUPPLY AND TRANSFORMATION
(QUADS)

YEAR	INDIGENOUS PRODUCTION					ADDITIONAL SOURCES				PRIMARY GAS TOTAL	TRANSFORMATION				GAS USED BY FINAL CONSUMERS TOTAL	TOTAL GAS SUPPLIED TO U.S. ECONOMY[e]
	CONVENTIONAL GAS			UNCONVENTIONAL GAS[c]	TOTAL	NET IMPORTS		STOCK CHANGES	OTHER[d]		TO ELECTRICITY	SYNTHETICS[a]				
	CONTINENTAL U.S.[b]	NORTH ALASKA	TOTAL			PIPELINE	LIQ. NATURAL GAS					FROM OIL (SNG)	FROM COAL	TOTAL		
HIST. 1960	12.7	- -	12.7	- -	12.7	0.1	- -	-0.1	-0.3	12.4	-1.8	- -	- -	- -	10.6	12.4
1965	15.8	- -	15.8	- -	15.8	0.4	- -	-0.1	-0.3	15.8	-2.4	- -	- -	- -	13.4	15.8
1970	21.7	- -	21.7	- -	21.7	0.8	- -	-0.4	-0.1	21.8	-4.1	- -	- -	- -	17.7	21.8
1975	19.6	- -	19.6	- -	19.6	0.9	- -	-0.3	-0.3	19.9	-3.2	- -	- -	- -	16.7	19.9
1980	19.9	- -	19.9	- -	19.9	1.0	- -	- -	-0.5	20.4	-3.8	- -	- -	- -	16.6	20.4
1985	16.9	- -	16.9	- -	16.9	0.9	- -	0.2	-0.3	17.7	-3.2	0.1	- -	0.1	14.7	17.9
ESTI. 1986	16.6	- -	16.6	- -	16.6	0.7	- -	-0.1	-0.5	16.7	-2.7	0.1	0.1	0.2	14.2	16.9
PROJ. 1990	17.1	- -	17.1	0.1	17.2	0.8	0.1	- -	- -	18.1	-3.0	0.1	0.1	0.2	15.2	18.2
1995	17.3	- -	17.3	0.2	17.5	1.6	0.2	- -	- -	19.3	-3.2	- -	0.1	0.1	16.2	19.4
2000	15.6	- -	15.6	0.3	15.9	2.6	0.4	- -	- -	18.9	-2.7	- -	0.1	0.1	16.3	19.0
2005	12.6	- -	12.6	2.2	14.8	3.2	0.6	- -	- -	18.6	-2.2	- -	0.1	0.1	16.5	18.7
2010	10.4	- -	10.4	3.0	13.5	3.3	0.9	- -	- -	17.6	-1.6	- -	0.3	0.3	16.3	17.9

PHYSICAL UNITS

YEAR	TRILLION CU. FT.															TCF
ESTI. 1986	16.0	- -	16.0	- -	16.0	0.7	- -	-0.1	-0.5	16.1	-2.6	0.1	0.1	0.2	13.9	16.5
PROJ. 1990	16.5	- -	16.5	0.1	16.6	0.8	0.1	- -	- -	17.5	-2.9	0.1	0.1	0.2	14.7	17.7
1995	16.8	- -	16.8	0.2	17.0	1.6	0.2	- -	- -	18.7	-3.1	- -	0.1	0.1	15.7	18.8
2000	15.1	- -	15.1	0.3	15.4	2.5	0.4	- -	- -	18.3	-2.6	- -	0.1	0.1	15.8	18.4
2005	12.2	- -	12.2	2.2	14.4	3.1	0.6	- -	- -	18.0	-2.1	- -	0.1	0.1	16.0	18.1
2010	10.1	- -	10.1	2.9	13.0	3.2	0.9	- -	- -	17.1	-1.6	- -	0.3	0.3	15.8	17.3

a) Synthetic gas is included in primary gas supply, 1960-1980.
b) Includes South Alaskan gas.
c) Includes gas from tight sands, Devonian shale, coal seams and geopressurized brines. Increment over 1986.
d) A balancing item. Includes unaccounted for stock changes, losses, gains and supply.
e) Primary gas plus synthetic gas from oil and coal. Includes gas used to produce electricity.

TABLE 3-12: REFERENCE CASE--U.S. COAL SOLIDS SUPPLY AND TRANSFORMATION
(QUADS)

YEAR	INDIGENOUS PRODUCTION	ADDITIONAL SOURCES			PRIMARY COAL	TRANSFORMATION		COAL SOLIDS USED BY FINAL CONSUMERS	TOTAL COAL SOLIDS SUPPLIED TO U.S. ECONOMY[b]
	PRIMARY COAL PRODUCED TOTAL	NET IMPORTS	STOCK CHANGES	OTHER[a]	TOTAL	TO ELECTRICITY	TO SYNTHETIC FUELS	TOTAL	
HIST.									
1960	10.8	-1.0	0.1	-0.1	9.8	-4.2	- -	5.6	9.8
1965	13.1	-1.4	- -	-0.1	11.6	-5.8	- -	5.8	11.6
1970	14.6	-1.9	-0.3	-0.1	12.3	-7.2	- -	5.1	12.3
1975	15.0	-1.7	-0.7	0.1	12.7	-8.8	- -	3.9	12.7
1980	18.6	-2.4	-0.5	-0.3	15.4	-12.1	- -	3.3	15.4
1985	19.3	-2.4	0.6	- -	17.5	-14.5	-0.1	2.9	17.5
ESTI.									
1986	19.5	-2.2	-0.1	0.1	17.3	-14.5	-0.1	2.7	17.3
PROJ.									
1990	21.3	-2.5	- -	- -	18.8	-16.1	-0.1	2.5	18.8
1995	24.5	-2.6	- -	- -	21.9	-19.3	-0.2	2.4	21.9
2000	28.2	-2.9	- -	- -	25.3	-22.6	-0.2	2.5	25.3
2005	34.2	-3.1	- -	- -	31.1	-27.6	-0.2	3.2	31.1
2010	39.6	-3.6	- -	- -	36.0	-31.4	-0.5	4.2	36.0

PHYSICAL UNITS

YEAR	MILLION TONS							MMT
ESTI.								
1986	898	-83	-8	7	813	-691	-5	117	813
PROJ.								
1990	983	-96	- -	- -	888	-764	-6	118	888
1995	1133	-99	- -	- -	1034	-912	-8	114	1034
2000	1310	-110	- -	- -	1199	-1072	-9	118	1199
2005	1587	-118	- -	- -	1469	-1309	-9	150	1469
2010	1833	-135	- -	- -	1698	-1485	-22	191	1698

a) A balancing item. Includes unaccounted for private stock changes, losses, unaccounted for supply and anthracite shipped oversees to U.S. Armed Forces.
b) Includes coal used to produce electricity and synthetic fuels.

TABLE 3-13: REFERENCE CASE--U.S. RENEWABLE ENERGY PRODUCTION AND CONSUMPTION
(QUADS)

YEAR	INDIGENOUS PRODUCTION														PRIMARY RENEWABLES TOTAL	TRANSFORMATION		RENEWABLES USED BY FINAL CONSUMERS TOTAL
	CENTRAL ELECTRICITY INPUTS						DISPERSED									TO CENTRAL ELECTRICITY	TO ALCOHOL FUELS[b]	
	HYDRO/ GEOTH.	WOOD	SOLAR THERMAL	PHOTO-VOLTAIC	WIND	TOTAL	BIOMASS WOOD	BIOMASS OTHER[a]	ACTIVE SOLAR HEATING/ COOLING	AGRIC. INDUST. PROCESS HEAT	GEO-THERMAL	PHOTO-VOLTAIC	WIND	TOTAL				
HIST. 1960	1.7	- -	- -	- -	- -	1.7	1.3	- -	- -	- -	- -	- -	- -	1.3	3.0	-1.7	- -	1.3
1965	2.1	- -	- -	- -	- -	2.1	1.3	- -	- -	- -	- -	- -	- -	1.3	3.4	-2.1	- -	1.3
1970	2.7	- -	- -	- -	- -	2.7	1.4	- -	- -	- -	- -	- -	- -	1.4	4.1	-2.7	- -	1.4
1975	3.2	- -	- -	- -	- -	3.2	1.5	- -	- -	- -	- -	- -	- -	1.6	4.8	-3.2	- -	1.6
1980	3.0	- -	- -	- -	- -	3.0	2.2	- -	- -	- -	- -	- -	- -	2.3	5.3	-3.0	- -	2.3
1985	3.1	- -	- -	- -	- -	3.1	2.7	0.1	- -	- -	- -	- -	- -	2.8	5.9	-3.1	- -	2.8
ESTI. 1986	3.2	- -	- -	- -	- -	3.3	2.6	0.1	- -	- -	- -	- -	- -	2.8	6.0	-3.3	- -	2.8
PROJ. 1990	3.5	- -	- -	- -	- -	3.5	2.7	0.2	0.1	- -	- -	- -	- -	2.9	6.4	-3.5	-0.1	2.9
1995	4.0	- -	- -	- -	0.1	4.2	2.8	0.2	0.1	0.1	0.1	- -	- -	3.4	7.5	-4.2	-0.1	3.4
2000	4.5	0.1	- -	- -	0.4	5.0	3.1	0.3	0.1	0.2	0.1	- -	0.1	3.8	8.9	-5.0	-0.2	3.8
2005	4.8	0.1	0.1	0.2	0.7	5.9	3.3	0.5	0.1	0.3	0.2	- -	0.1	4.5	10.3	-5.9	-0.3	4.5
2010	5.1	0.1	0.1	0.7	1.2	7.3	3.6	0.9	0.1	0.3	0.3	0.2	0.1	5.4	12.7	-7.3	-0.6	5.4

PHYSICAL UNITS

YEAR	MILLION BDOE																	
ESTI. 1986	1.5	- -	- -	- -	- -	1.5	1.2	0.0	- -	- -	- -	- -	- -	1.3	2.8	-1.5	- -	1.3
PROJ. 1990	1.7	- -	- -	- -	- -	1.7	1.3	0.1	- -	- -	- -	- -	- -	1.4	3.0	-1.7	- -	1.4
1995	1.9	- -	- -	- -	0.1	2.0	1.3	0.1	- -	0.1	- -	- -	- -	1.6	3.6	-2.0	- -	1.6
2000	2.1	- -	- -	- -	0.2	2.4	1.4	0.1	- -	0.1	0.1	- -	- -	1.8	4.2	-2.4	-0.1	1.8
2005	2.3	- -	- -	0.1	0.3	2.8	1.6	0.2	- -	0.1	0.1	- -	- -	2.1	4.9	-2.8	-0.2	2.1
2010	2.4	- -	0.1	0.3	0.6	3.4	1.7	0.4	- -	0.1	0.1	0.1	0.1	2.5	6.0	-3.4	-0.3	2.5

a) Includes sewer and landfill gas, municipal and agricultural waste, and biomass alcohol inputs.
b) Included in renewables used by final consumers.

TABLE 3-14: REFERENCE CASE--KEY ECONOMIC DATA AND ASSUMPTIONS

	U.S.						
YEAR	GNP (BIL. 1986 DOLLARS)	POPULATION (MILLIONS)	OCCUPIED HOUSING STOCK (MILLIONS)	COMMERCIAL FLOOR SPACE (BIL.SQ.FT)	INDUSTRIAL PRODUCTION INDEX (1985=100)	TOTAL AUTOS (MILLIONS)	TOTAL TRUCKS (MILLIONS)
HIST.							
1960	1907	180.7	53.0	15.8	39.3	57.1	12.0
1965	2391	194.3	58.0	20.3	53.1	68.9	14.8
1970	2766	205.1	63.5	24.3	63.1	80.5	18.8
1975	3086	216.0	72.5	28.3	68.1	95.2	25.8
1980	3649	227.7	80.4	31.6	87.2	104.6	36.0
1985	4104	239.2	87.3	35.9	100.0	114.7	42.4
ESTI.							
1986	4210	241.5	88.7	36.8	101.1	115.9	43.5
PROJ.							
1990	4826	249.9	95.2	41.0	122.6	120.7	50.8
1995	5583	259.9	101.8	45.3	146.3	128.8	58.2
2000	6298	268.3	107.7	49.5	167.2	134.0	64.0
2005	7126	276.0	113.2	55.0	193.4	141.4	70.0
2010	8002	283.6	118.1	60.8	221.6	148.8	76.4

TABLE 3-15: REFERENCE CASE--U.S. OIL AND NATURAL GAS RESERVES

YEAR	OIL[a] (QUADS)		GAS[a] (QUADS)	
	PROVEN RESERVES	ADDITIONS	PROVEN RESERVES	ADDITIONS
HIST.				
1960	N/A	N/A	N/A	N/A
1965	N/A	N/A	N/A	N/A
1970	N/A	N/A	N/A	N/A
1975	N/A	N/A	N/A	N/A
1980	133.0	14.3	170.0	16.0
1985	123.9	16.6	164.5	13.4
ESTI.				
1986	116.1	9.4	164.1	15.5
PROJ.				
1990	90.9	7.9	140.4	16.3
1995	70.7	7.7	134.5	14.1
2000	60.6	7.4	116.8	11.0
2005	55.1	6.7	95.2	7.3
2010	48.7	5.3	74.3	6.7

a) Lower 48 states only (excludes NGL).

TABLE 3-16: REFERENCE CASE--HIGHWAY VEHICLE DATA AND ASSUMPTIONS[a)]

YEAR	AUTOMOBILES				ALL VEHICLES			
	OPERATING VEHICLES (MILLION)	TOTAL VEHICLE MILES (BILLION)	FUEL CONSUMPTION (BILLION GALLONS)	ROAD MPG	OPERATING VEHICLES (MILLION)	TOTAL VEHICLE MILES (BILLION)	FUEL CONSUMPTION (BILLION GALLONS)	ROAD MPG
HIST.								
1960	57.1	588	41.0	14.4	67.9	719	57.9	12.4
1965	68.9	706	49.7	14.2	82.0	888	71.1	12.5
1970	80.4	891	65.6	13.6	98.2	1121	92.3	12.1
1975	95.2	1028	76.0	13.5	120.0	1330	109.0	12.2
1980	104.6	1112	73.4	15.1	139.9	1521	114.9	13.2
1985	114.7	1315	69.7	18.5	157.1	1747	114.1	15.3
ESTI.								
1986	118.7	1356	70.9	19.1	162.2	1812	115.4	15.7
PROJ.								
1990	120.7	1539	70.3	21.9	171.5	2104	117.7	17.9
1995	128.8	1676	68.0	24.7	187.0	2320	115.9	20.0
2000	134.0	1766	67.9	26.0	198.0	2474	117.1	21.1
2005	141.4	1899	70.9	26.8	211.3	2670	121.1	22.0
2010	148.8	2032	74.4	27.3	225.2	2871	126.7	22.7

a) Some historical data are from the Monthly Energy Review and are not directly comparable with data underlying the projections due to definitional differences.