ERDA 77-57

Program Plan for ERDA's Participation in the IEA Working Party on Energy Conservation Research and Development

February 1977

Division of Buildings
& Community Systems

Energy Research and
Development Administration

Washington, D.C. 20545

FOREWARD

I am pleased to present the Program Plan for ERDA's participation in the International Energy Agency (IEA) Working Party on Energy Conservation Research and Development (R&D). The plan documents the projects currently being conducted by the working party and the projects proposed for consideration by its member nations. The proposed projects represent ERDA's interests, but also reflect the results of substantive discussions with R&D officials in other nations.

ERDA will update the program plan annually to ensure that it continues to reflect both the concept and details of the evolving IEA program. Eventually, the plan may include proposals from other U.S. agencies as well as ERDA. Research ideas from other nations could be presented either in this program plan or in others developed by those nations. Documentation of each nation's priorities will provide valuable guidance to officials seeking to identify areas of mutual interest.

Dr. Melvin H. Chiogioji
Chairman
Working Party on Energy Conservation
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INTRODUCTION

The International Energy Agency (IEA) was formed in the aftermath of the 1973 oil embargo by the United States and other members of the Organization for Economic Cooperation and Development (OECD) interested in working cooperatively to ensure adequate future supplies of energy. The Energy Research and Development Administration (ERDA) is responsible for coordinating the United States involvement in IEA's energy conservation research and development (R&D), which is administered by the Working Party on Energy Conservation R&D.

This document represents the Fiscal Year 1977 program plan for ERDA's participation in the Working Party on Energy Conservation R&D. The purposes of this program plan are to:

- Provide guidelines for United States participation in the working party program for use by ERDA and other federal agencies interested in cosponsoring research and development activities
- Identify the working party project areas in which ERDA and other federal agencies are presently participating, specifying financial commitments
- Identify the working party project areas in which ERDA and other federal agencies are planning to participate, specifying financial commitments.

The plan outlines specific goals and criteria for United States participation in the working party, and presents the current and planned participation of ERDA and other federal agencies. Supplementary information covering the following areas is also provided:

- Background of IEA, focusing on the Working Party on Energy Conservation R&D and its operating mechanisms (Appendix A)
- Membership of the working party (Appendix B)
- Annual activities and milestones for decisionmaking on United States participation in the working party (Appendix C)
- Current ERDA commitments to the working party (Appendix D)
- Planned ERDA involvement with the working party (Appendix E).

I. GOALS AND CRITERIA FOR UNITED STATES PARTICIPATION IN THE WORKING PARTY

ERDA's overall research, development, and demonstration (RD&D) program is designed to achieve the national policy and energy technology goals outlined in this year's A National Plan for Energy Research, Development, and Demonstration (ERDA 76-1). Projects pursued under the auspices of IEA's Working Party on Energy Conservation R&D must not only contribute to the achievement of those goals, but work toward the following additional goals, which recognize that such projects may be cosponsored by other nations and may be conducted outside the United States:

- Transfer technology among nations. Working party projects should encourage the mutual exchange of new and existing technology that will benefit member nations.

- Serve foreign policy goals. Working party projects should seek to increase the efficiency of energy use and its availability, and thus contribute to international economic and political stability. The projects in which the United States participates should strengthen the organizational framework for international cooperation and enhance United States relationships with other member nations by demonstrating goodwill and technical competence. Through the working party projects, the United States should strive both to strengthen the economies of friendly nations and to bolster its own trade position.

- Optimize United States RD&D expenditures. ERDA projects conducted within the working party should result in larger net benefits than would similar domestic RD&D activities. Projects in which the United States participates should enhance the use of ERDA funds and stimulate matching investments by other nations. The projects should enable the United States to obtain access to technology and manpower that would be more expensive to develop domestically.

- Promote the development of competitive United States industries. Working party projects cosponsored by the United States should encourage the growth of United States industries able to compete successfully in international markets, thereby strengthening the United States trade position. The projects should also help open new foreign markets to United States industry.

On the basis of these goals, ERDA has formulated a set of criteria for selecting working party projects in which to participate. The application of these criteria are intended to: (1) ensure that the projects in which ERDA participates are consistent with declared United States policy on domestic and international energy-related research and development; (2) provide guidance to ERDA and other federal agency personnel conducting negotiations

with representatives of other IEA nations to formulate possible projects; and (3) communicate ERDA's position on project objectives and management to other IEA member nations. The specific criteria are:

- Joint funding with other members. ERDA and other federal agencies should limit their participation to projects that have resource contributions from other working party member nations. The responsibilities and financial value of commitments of all parties should be stated and agreed to in the specific annex written for each project.

- Orientation of research to near-term solutions. ERDA and other federal agencies should concentrate on projects that: (1) can reasonably be expected to have substantial near-term impact on domestic and international energy problems, and (2) address specific end-user needs. The federal agency involved should concentrate its efforts in those areas of direct interest to the United States where it can make an important contribution.

- Identified program management and control. United States participation in working party projects should be structured to permit the agency involved to meet its commitments. Project responsibility should be vested in the agency office responsible for the corresponding research area in the United States. Contacts with international agencies and representatives of other nations should be carefully supervised to minimize the possibility of miscommunication or misunderstanding.

- Cost-effectiveness of investment. An R&D program conducted by ERDA or another federal agency that includes work under the auspices of IEA should generate more benefits than that program would without IEA involvement.

- Active involvement of United States interests. All IEA projects should include participation by those United States interests (commercial or otherwise) that can benefit most from the project. Representatives from such parties should be invited to review and participate in proposed projects to ensure that their needs are reflected in the planned activities.

- Consistency of project goals with agency goals. The objectives of working party projects in which the United States participates should be consistent with the overall program goals and activities of the agency involved. Every project should be recorded in a Program Approval Document (PAD) or equivalent agency document.

On the basis of these criteria, ERDA and several other federal agencies are presently participating in international R&D activities being conducted by IEA's Working Party on Energy Conservation R&D. Chapter II discusses ERDA's current commitments to working party project areas, and Chapter III outlines ERDA's planned involvement in working party project areas.

II. CURRENT UNITED STATES COMMITMENTS TO WORKING PARTY PROJECT AREAS

At its most recent meeting, held in July 1976, the Working Party on Conservation Research and Development identified 11 project areas and decided to develop an implementing agreement for each. These agreements have been prepared and discussed by the experts groups in each area and are currently being reviewed and signed by member nations interested in becoming contracting parties. Annexes have also been written to cover specific projects in several of the 11 project areas.

Work is currently under way in the following areas:

- Buildings and community systems
- Heat pumps
- Energy cascading
- Heat transfer
- Combustion
- Materials
- Industrial processes.

Proposed projects are being considered in the following areas:

- Energy storage
- Utilities
- Transportation
- Energy recovery.

Progress to date in each of these 11 project areas is briefly described in the following sections (see Appendix D for more details on specific projects). ERDA's financial commitments to the projects being conducted within those areas are delineated in Exhibit 1, which references an ERDA Program Approval Document (PAD) for each project.

CURRENT UNITED STATES COMMITMENTS TO WORKING PARTY PROJECT AREAS

IMPLEMENTING AGREEMENTS AND ANNEXES	ERDA PROGRAM APPROVAL DOCUMENT (PAD) CROSS REFERENCE						TOTAL	NOTES[1]
	BUILDINGS AND COMMUNITY SYSTEMS	INDUSTRIAL ENERGY CONSERVATION	TRANSPORTATION	ELECTRIC ENERGY SYSTEMS	ENERGY STORAGE	CONSERVATION RESEARCH AND TECHNOLOGY		
BUILDINGS & COMMUNITY SYSTEMS								
Annex 1: Comparison of building energy analysis programs	Unspecified							Expenses depend on programs analyzed
Annex 2: Demonstration of systems science of ekistics	$150,000							
Annex 3: Wiehl/Esslingen demonstration	$240,000							3-year (possibly 5-year) project[2] at $240,000 initial; future years by mutual agreement
HEAT PUMPS								
Annex 1: Heat pumps systems with thermal storage	Note 3							3-year project
ENERGY CASCADING								
Annex 1: Common Study	$268,000	May also be included						2-year project at $500,000
HEAT TRANSFER								
Annex 1: Optimal design of heat exchanger networks	U.S. is not a participant in this study							
Annex 2: Extended surface heat transfer	U.S. is not a participant in this study							
Annex 3: Heat transfer tube vibration						$133,333		3-year project at $400,000
COMBUSTION								
Annex 1: Combustion process						$223,333		3-year project at $670,000
MATERIALS						May be included		Implementing agreement being drafted by U.S.
INDUSTRIAL PROCESSES		May be included				May be included		Implementing agreement being drafted by Sweden
ENERGY STORAGE								Draft implementing agreement completed
UTILITIES*			May be included	May be included				Currently no activity
TRANSPORTATION*			May be included	May be included		May be included		Currently no activity
ENERGY RECOVERY						May be included		Implementing agreement being drafted by U.S.

* Implementing agreements have not yet been drafted.

[1]Financial information includes contributions from all participants.

[2]The Federal Republic of Germany has already contributed $5,000,000 to this project.

[3]No additional cost to ongoing ACES program.

BUILDINGS AND COMMUNITY SYSTEMS

An implementing agreement and a first annex are in the final stages of ratification by Austria, Canada, the Federal Republic of Germany, Sweden, the United Kingdom, and the United States. Under the annex, various computer capabilities for estimating energy loads and usage in buildings will be compared to one another and against standard test buildings. Substantial information on specific computer programs has already been exchanged, particularly relating to analysis programs in Sweden, the United Kingdom, and the United States. ERDA has taken the lead in drafting the annex and in developing a detailed work plan and schedule. The ultimate purpose of the project is to establish a common and accepted language for future RD&D and for international commerce. In addition, a joint effort will be undertaken to develop techniques for analyzing energy use in buildings with opening windows.

A second annex has been executed for a project to add energy to the overall ekistics model for the design of energy-efficient new communities.

A bilateral implementing agreement has been signed by the Federal Republic of Germany and the United States to conduct a demonstration of heat pumps and other advanced energy systems in the two facilities at Wiehl and Esslingen, both in the Federal Republic of Germany. The Wiehl project involves a multi-purpose community recreational facility whose energy systems feature integrated subsystems (e.g., waste heat utilization, heat recovery from wastewater and ventilation exhaust, wastewater utilization, heat loss reduction, solar energy collection, heat pumps). Operating tests, analyses, and technological studies and evaluations will be conducted over a period of 5 to 10 years. The shell of the facility and solar arrays were completed by December 1975 and the system hardware was installed by July 1976. Initial data collection has begun.

In the Esslingen project, all space heating and domestic hot water requirements for a complex of three high-rise apartment buildings are provided through use of a central water-to-water heat pump system which extracts heat from river water. The building complex also has an alternate oil-fired heating system which can meet the full heating requirements. The performance of the heat pump system will be evaluated and compared with that of oil-fired heating over a period of three to five years. The project will also evaluate the effects on energy usage of different end-use heat delivery systems (e.g., floor vs radiator heating) and two different thicknesses of exterior wall insulation. All three buildings have been completed and occupied, and the conventional and heat pump systems have been installed. Instrumentation and data acquisition systems are also in place, and initial data collection is under way.

HEAT PUMPS

An implementing agreement and annex are nearing ratification to facilitate the exchange of information on demonstrations and experiments on heat pumps with associated heat storage systems being conducted in Austria, Canada, Denmark, the Federal Republic of Germany, Ireland, New Zealand, Sweden, the United Kingdom, the United States, and the European Community. The United States is contributing the Buildings and Community Systems Program ACES.

ENERGY CASCADING

Agreement is expected by February 1977 on an implementing agreement to investigate potential RD&D opportunities in the area of energy cascading which could include: (1) all-electric systems for high-efficiency electricity generation; (2) combined systems which partly produce electricity, such as total energy systems; (3) all-heat systems in which no electricity is produced; and (4) total systems as analyzed from energy source to final use.

Austria (the lead country), the Federal Republic of Germany, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States have expressed interest in this project area. The first annex will be for a common study to assess the markets and commercialization opportunities for energy cascading in IEA member nations. The study, which is being managed by the United States, is expected to begin during 1977 and quickly lead to important conservation RD&D opportunities. The United States and Austria have played the key roles in pursuing agreement on the implementing agreement and developing the work plan for the common study.

HEAT TRANSFER

Bilateral agreements have been signed by the United Kingdom and the United States, and Sweden and the United States, and a trilateral agreement has been signed by Sweden, the United Kingdom, and the United States in the heat transfer area. The experts group recently decided to organize additional research into the areas of: (1) optimal design of heat exchanger networks; (2) extended surface heat transfer; and (3) heat exchanger tube vibration. An implementing agreement and annexes to cover research in each of these three areas are currently under review by the members of the experts group; agreement is expected by early 1977. The United States and the United Kingdom have played the key roles in obtaining agreement in this area.

COMBUSTION

Combustion was within the heat transfer area until the July 1976 meeting of the working party, when it was established as a separate project area to work toward a separate implementing agreement. The United States, Sweden, and the United Kingdom took the lead in forming an experts group in this area. A draft implementing agreement and annex have been negotiated and are being circulated to the national delegations for comment and review. Execution is planned for early 1977.

MATERIALS

This new project area was established at the July 1976 meeting of the working party. Representatives of the United States and the United Kingdom have met informally and identified the following areas of interest:

- Improved energy conversion efficiency
  - High-temperature materials for engine components, heat exchangers, and combustors, including alloys and special ceramics (silicon nitride, silicon carbide, ceramic composites)
  - Catalysts, electrolytes, and other materials for fuel cells
- Energy Storage
  - Separators, containers, and other materials for high-temperature batteries
  - Alloys and reinforced plastics for use in flywheels and thermal energy storage vessels
- Electrical energy systems
  - Low-loss transformer steels
  - Insulation for electrical transmission lines
- Other program areas
  - Energy-savings in materials production processes, particularly metals and glasses
  - Thermal insulation for buildings
  - Reinforced plastics for reducing weight in vehicles
  - Separation, processing, and utilization of materials from industrial and municipal waste streams.

The United States is taking the lead in assembling representatives of interested countries into an experts group; the group is expected to be formed by October 1976. No specific project annexes have yet been defined.

INDUSTRIAL PROCESSES

This new project area was established at the July 1976 meeting of the working party. Sweden is taking the lead in assembling an experts group and drafting an implementing agreement. No specific project annexes have yet been defined.

ENERGY STORAGE

The participating nations have discussed mutual interests and an implementing agreement and associated annexes have been drafted for cooperative efforts in the areas of: (1) long-term storage for district heating; (2) storage applied to solar houses; and (3) short-term storage and advanced technologies. Agreement has not yet been reached on any specific annexes. At present, the United States is not participating actively in this area.

UTILITIES

Utilities systems and load management R&D projects were discussed at the March and July 1976 meetings of the working party. Specific areas for cooperative research are expected to be identified in the near future.

TRANSPORTATION

Several possible projects have been proposed in this area, including diesel engines, electric cars, and electrochemical storage systems. However, since the member nations perceive a lack of near-term commercial payoff in this area, cooperative projects have not yet been identified.

ENERGY RECOVERY

The Federal Republic of Germany held a symposium on waste heat management in 1975; since that time, little related activity has occurred. At the July 1976 meeting of the working party, prospects for cooperative effort were reviewed and it was decided to broaden the area covered by the experts group to include other forms of energy recovery in addition to waste heat. Accordingly, the area's designation was changed from waste heat management to energy recovery. The Federal Republic of Germany, which chaired the experts group in waste heat, is taking the lead in assembling a group in energy recovery and drafting an implementing agreement and annexes.

III. PLANNED UNITED STATES INVOLVEMENT IN WORKING PARTY PROJECT AREAS

In addition to its current commitments, ERDA is interested in pursuing other cooperative projects with IEA member nations in all 11 working party project areas. This chapter lists the projects ERDA proposes for cooperative action beginning in fiscal year 1978 (see Appendix E for more detail). During fiscal year 1977, ERDA officials will be working to reach agreement with other IEA member nations on implementation agreements or annexes covering these projects.* ERDA's proposed financial commitments to the projects identified are delineated in Exhibit 2, which references an ERDA PAD for each project.

BUILDINGS AND COMMUNITY SYSTEMS

Buildings

- Demonstrations of energy-efficient building designs and components
- Development of standard building energy load and usage analysis techniques (extension of current commitment with emphasis on natural ventilation)
- Additional equipment demonstrations at Wiehl and Esslingen (extension of current commitment).

Integrated Energy Systems

- Integrated Community Energy System (ICES) -- evaluation of district heating systems
- Demonstrations of grid-connected total energy systems
- Development of inventory of international data and methodologies for evaluating modular integrated utility and total energy systems (MIUS).

Community Design -- Site-specific demonstration of ekistics methodology (extension of current commitment).

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* Since ERDA cannot determine unilaterally whether these projects will be pursued under the auspices of IEA, the commitments of the ERDA program managers should not be considered firm commitments. However, since all the projects meet the goals for United States participation in the working party, they will receive attention in ERDA domestic programs regardless of IEA action.

Exhibit 2

PLANNED UNITED STATES INVOLVEMENT IN WORKING PARTY PROJECT AREAS

PROPOSED PROJECTS	ERDA PROGRAM APPROVAL DOCUMENT (PAD) CROSS REFERENCE						TOTAL
	BUILDINGS AND COMMUNITY SYSTEMS	INDUSTRIAL ENERGY CONSERVATION	TRANSPORTATION	ELECTRIC ENERGY SYSTEMS	ENERGY STORAGE	CONSERVATION RESEARCH AND TECHNOLOGY	
BUILDINGS AND COMMUNITY SYSTEMS	*						
Buildings							
Integrated community energy systems							
Community design							
Municipal wastes							
HEAT PUMPS	*					*	
New Operating fluids							
ENERGY CASCADING	*	*		*			
Demonstrations of energy cascading in industry							
Applications of waste heat to food production							
Development of Treble Rankine cycles							
Educational program on entropy balancing							
HEAT TRANSFER						*	
Fluidized-bed heat exchanger							
Fouling factors on heat exchangers							
Dew point of sulfuric acid							
COMBUSTION						*	
Extension of current commitments							
Alternative/modified fuels							
MATERIALS						*	
Improved high-temperature materials							
New processes for recovering and processing plastics							
INDUSTRIAL PROCESSES		*				*	
Instrumentation and software to monitor industrial equipment							
Improved techniques for industrial unit operations							
ENERGY STORAGE					*	*	
Electrolytic production of H_2							
Molten batteries							
Compressed air storage							
Flywheel storage							
Workshops							
UTILITIES (no projects)							
TRANSPORTATION			*			*	
Modeling of lubrication, friction, and wear							
Stress analysis of vehicle tires and suspensions							
ENERGY RECOVERY (no projects)						*	

Municipal Wastes -- Demonstrations of bioconversion technologies, including joint demonstrations or joint funding for ongoing projects in the United States.

HEAT PUMPS -- Development of new operating fluids for heat pumps.

ENERGY CASCADING

- Demonstrations of energy cascading in industry
- Applications of waste heat to food production
- Development of Treble Rankine cycles
- Educational program on entropy balancing.

HEAT TRANSFER

- Evaluation of fluidized-bed heat exchanger for use in Rankine cycle
- Experimental determination of fouling factors for carbon on heat exchangers placed in waste heat exhaust stream
- Experimental determination of the dew point of sulfuric acid in waste heat exhaust stream.

COMBUSTION

- Extensions of the work included in current commitments (see current commitments)
- Determination of combustion properties of alternative and modified fuels (additives, blending, emulsification).

MATERIALS

- Development of improved high-temperature materials
  - Development of improved hot-pressing of large industrial turbine engine components (Si_3N_4 and SiC)
  - Characterization and evaluation of ceramics for large industrial utility gas turbines
  - Development of non-destructive methods for evaluating ceramic components

- Development and demonstration of new processes for recovering and processing plastics from industrial and municipal wastes.

INDUSTRIAL PROCESSES

- Development of instrumentation and related software to monitor industrial equipment
- Development of improved techniques for industrial unit operations.

ENERGY STORAGE

- Demonstration and evaluation of improved technologies for electrolytic production of H_2 to supplement natural gas supplies and for other uses
- Development and test of experimental molten batteries
- Demonstration of compressed air storage facility
- Demonstration of flywheel storage application
- International workshops on energy storage.

UTILITIES

No proposed projects.

TRANSPORTATION

- R&D and modeling of lubrication, friction, and wear in traction drives and reciprocating engines
- Development of improved techniques for stress analysis of vehicle tires and suspensions.

ENERGY RECOVERY

No proposed projects.

APPENDIX A

BACKGROUND OF IEA, FOCUSING ON THE WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT AND ITS OPERATING MECHANISMS

The oil embargo of 1973 and the associated increases in world oil prices severely disrupted the economies of most oil-importing nations. The embargo brought to public attention the important shifts in energy supply and demand that have occurred since World War II. From 1960-1973, oil consumption grew at an annual rate of 7-13 percent in European countries, 4.3 percent in the United States, and 17.9 percent in Japan. Most of the increased demand was supplied by imports of Arabian oil. By 1973, Arabian oil was supplying 60 percent of Europe's energy, 17 percent of the United States energy, and 90 percent of Japan's energy.*

In response to the embargo and these longer term trends, the United States and most other members of the Organization for Economic Cooperation and Development (OECD) agreed, in September 1974, to develop an International Energy Program (IEP). The program was to serve as a vehicle for the participating nations to cooperate on energy research and development (R&D) programs and to share energy imports in times of emergency. To administer, monitor, and execute the IEP, the participating nations established the International Energy Agency (IEA) as an autonomous institution within OECD. Nineteen nations are currently participating in IEA: Austria, Belgium Canada, Denmark, the Federal Republic of Germany, Greece, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Under special arrangement (Article 72 of the basic agreement), the European Community and OECD's Nuclear Energy Agency also participate.

At IEA's initial meeting in November 1974, the following specific objectives were defined:**

- To promote secure oil supplies
- To develop an emergency self-sufficiency in oil supplies, restraining demand and allocating available oil among member countries on an equitable basis
- To promote cooperative relations with oil-producing countries and with other oil-consuming countries, including those of the developing world
- To reduce member-country dependence on imported oil by undertaking long-term cooperative efforts on energy conservation, accelerated development of alternative sources of energy, energy research and development, and uranium enrichment.

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* International Economic Report of the President, Council on International Economic Policy, March 1975.

** As stated in the Agreement on an International Energy Program, National Fuels and Energy Policy Study, Serial No. 93-53, U.S. Government Printing Office, November 1974.

To accomplish these objectives, IEA was organized (see Exhibit A-1) into a Governing Board (composed of one or more ministers or their delegates from each participating country), a Management Committee (composed of one or more senior representatives of the government of each participating country), and the following four standing groups (each composed of one or more representatives of the government of each participating country):

- Emergency Questions - to deal with emergency self-sufficiency, demand restraint, allocation, and activation, and to maintain an information system on the international oil market (Articles 1-36 of the agreement).

- Oil Market - to develop an international oil market information system and to establish an internal, permanent framework for obtaining information from or consulting with individual companies in the oil industry (Articles 35-40 of the agreement).

- Long-Term Cooperation on Energy - to reduce member dependence on imported oil over the longer term (Articles 41-43 of the agreement).

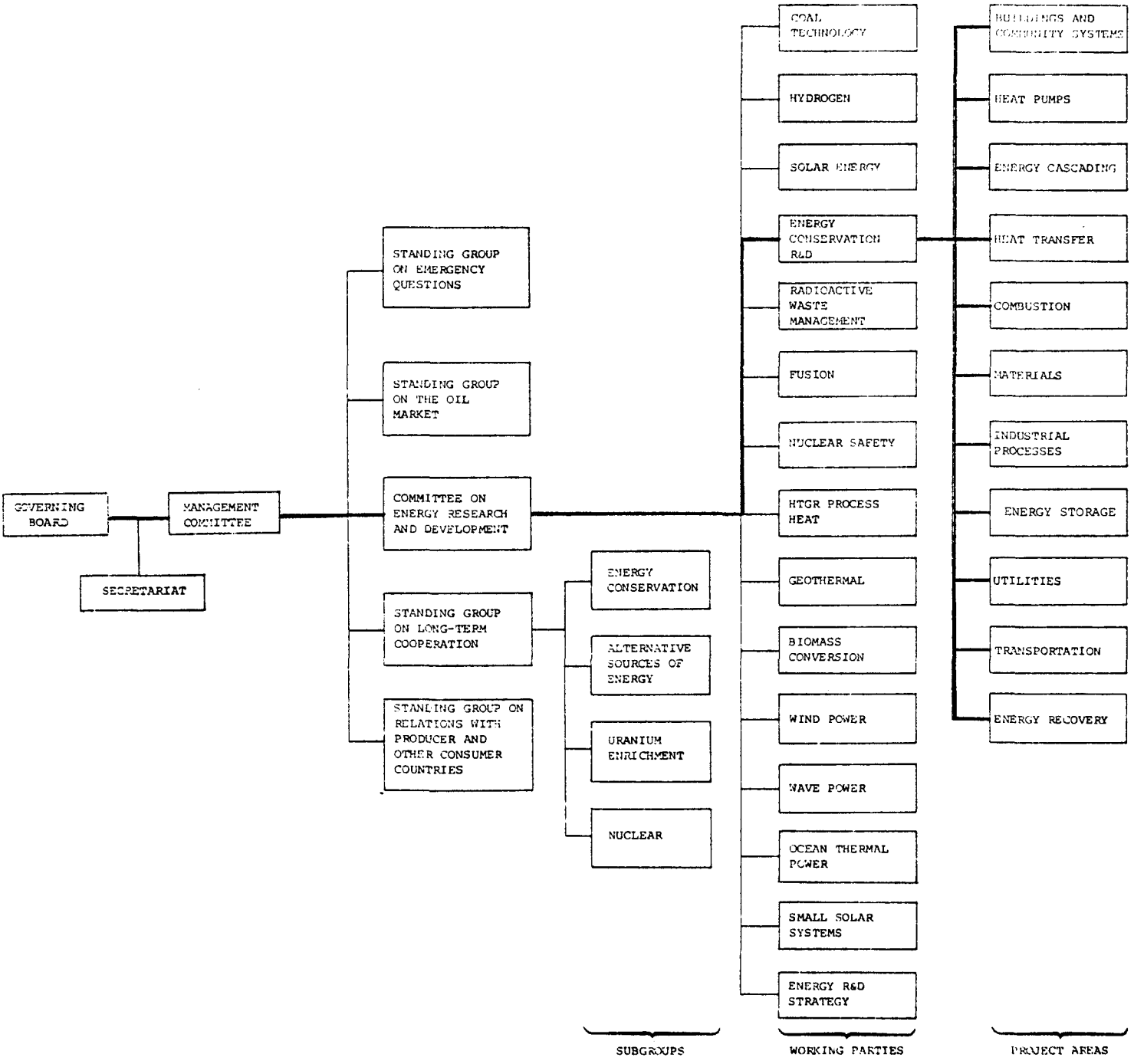
- Relations with Producer and Other Consumer Countries - to promote cooperative relations with oil-producing nations (Articles 44-48 of the agreement).

The member nations agreed that, except in the case of the Standing Group on Emergency Questions, standing group project participation would be strictly voluntary.

The Standing Group on Long-Term Cooperation (LTC) on Energy originally selected four major areas on which to focus its efforts: energy conservation, alternative sources of energy, energy research and development, and uranium enrichment. An autonomous subgroup was established for each of these areas and charged with responsibility for developing and conducting related cooperative projects. However, in recognition that energy research and development represents a broad area which offers significant opportunity for formulating solutions to the major consumer nations' energy problems, in November 1975, the Subgroup on Energy R&D was redesignated a committee of equal status with the four standing groups. The committee was mandated to work closely with the Standing Group on Long-Term Cooperation on Energy to assure a coordinated long-term program. In July 1976, the LTC standing group also chartered the Subgroup on Nuclear Energy.

The IEA activities in which ERDA and several other United States agencies have been most actively involved have been conducted under the Committee on Energy Research and Development. As IEA members express interest in developing and conducting cooperative energy R&D projects, working parties are established comprised of representatives of those member nations interested in participating in a particular project area. Under the chairmanship of a designated lead country or organization, each

INTERNATIONAL ENERGY AGENCY ORGANIZATIONAL STRUCTURE



working party seeks to develop a cooperative program of mutually beneficial projects relating to various energy technologies. Currently, 15 IEA working parties are conducting cooperative energy R&D projects in the areas of coal technology, hydrogen, solar energy, energy conservation, radioactive waste management, fusion, nuclear safety, high-temperature reactors for process heat, geothermal, biomass conversion, wind power, wave power, ocean thermal power, small solar systems, and energy R&D strategy.

Various United States agencies are participating in all 15 working parties, and the United States has been designated the IEA lead country for working party efforts in the areas of energy conservation research and development, nuclear safety, ocean thermal energy, and energy R&D strategy. The remaining sections of this appendix outline the history, objectives, and scope of ERDA's participation in the Working Party on Energy Conservation Research and Development, and briefly describe the relationships that IEA and ERDA maintain with other international organizations.

WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT

In recognition that R&D directed toward the more efficient use of energy offers significant potential for short-term benefits, IEA established the Working Party on Energy Conservation R&D to promote cooperative implementation of energy conservation R&D programs. The working party has defined four objectives that guide its research activities:

- Development of an international mechanism by which energy conservation research, development, and demonstration can be performed for the maximum mutual benefit of participants, and accelerate the realization of those benefits

- Identification of areas of mutual interest that represent major opportunities for more efficient utilization of energy

- Definition and implementation of mechanisms by which information and/or RD&D results will be developed and exchanged

- Performance of research, development, and demonstrations in areas that have major energy conservation potential.

The Working Party on Energy Conservation Research and Development is currently conducting or formulating projects in 11 areas: buildings and community systems, heat pumps, energy cascading, heat transfer, combustion, materials, industrial processes, energy storage, utilities, transportation, and energy recovery.

Once an area is agreed upon as appropriate for cooperative RD&D, those countries wishing to participate form an ad hoc committee, called an experts group, to develop and direct preparation for cooperative RD&D agreements in that area. The various experts groups report their activities to the working

party. Most working party members participate in at least one experts group. Project areas are added or deleted as the interests of the member nations change.

To enable work to begin in a project area, the experts group, with assistance from the IEA Secretariat, drafts an implementing agreement (IA), which serves as the legal document specifying the conditions of cooperative RD&D in that project area. An implementing agreement specifies: (1) objectives of the research; (2) procedures for initiating specific tasks or annexes under the IA; (3) procedures for establishing an executive committee to oversee activities conducted under the IA; (4) procedures for establishing and replacing operating agents responsible for the tasks in an annex; (5) procedures for financing of RD&D by participants in a given annex; (6) provisions on information exchange and intellectual property; (7) a statement of legal responsibilities and insurance arrangements; (8) provisions for addition or withdrawal of contracting parties; and (9) term of agreement and amendment provisions.

Each experts group establishes an executive committee to plan the research to be performed under the IA. In general, the representatives in the experts group become the original members of the executive committee; in moving to the executive committee, they dissolve the experts group and their nations become the original contracting parties to the IA. If another IEA member nation chooses to participate in the research, it may do so by signing the IA and at least one annex, and providing representation to the executive committee. Once the executive committee is formed, the project functions independently of the working party, and is only required to submit a formal annual report to the Energy Conservation RD&D Working Party.

The IA does not generally specify the details of the RD&D to be performed in a project area. Instead, annexes are written for specific projects, covering: (1) objectives of the project; (2) statement of work and division of responsibilities among participants; (3) project schedule and budget; (4) amount of project budget to be contributed by each participant; (5) name of operating agent or agents who will conduct the research; and (6) specific duties of the operating agent.

A major task of the executive committee is to propose new annexes to the IA and any needed revisions to existing annexes. The entire executive committee does not become involved in the direction of research under an annex. Instead, only those nations that have signed an annex and agreed to cosponsor the annex activities participate in directing the work. The signatories to an annex are called the participants to the annex. Generally, most of the members of the executive committee become participants to the annex.

The actual research, development, and demonstrations under a given project are performed by an operating agent chosen by the participants and accountable to the executive committee. The operating agent is usually a government agency or a commercial enterprise designated by one of the participating nations.

Different individuals may represent the same country in different groups. For example, while a member nation's representative on the working party is usually a senior official in charge of energy R&D activities in that nation, its representative on an experts group is usually a more technically oriented official who deals with the details of an implementing agreement or annex. A nation's representative to an executive committee is usually the same individual who was in the experts group.

New implementing agreements and annexes that are proposed by the working party or its executive committees must be approved by the IEA member nations before work can begin. (Exhibit A-2 outlines the sequence of approval steps). Both technical and legal approval are required. To expedite the approval process, the chairman of the working party works closely with his counterparts in other countries and with the IEA Secretariat in Paris.

RELATIONSHIPS OF IEA AND ERDA WITH OTHER INTERNATIONAL ORGANIZATIONS

IEA and ERDA maintain strong relationships with several other international agencies that perform energy conservation R&D. In many cases, a nation's IEA representative in a technical area also represents that nation in other organizations, thereby facilitating coordination.

NATO Committee on the Challenges of Modern Society (CCMS)

A major organization with which IEA maintains a close relationship is the NATO Committee on the Challenges of Modern Society (CCMS). CCMS was founded in 1969, at the initiative of the United States, to deal with environmental and other problems that impact significantly on the quality of life in modern industrialized societies.

Three central working concepts guide CCMS activities: pilot study approach, action orientation, and open publicity. Under the pilot study approach, the country that proposes a project is designated that project's pilot country and is entrusted with responsibility for planning the study, preparing related reports, and initiating the implementation of study recommendations. The action-orientation concept is reflected in the aim of participating countries that CCMS studies be completed quickly, with the results being provided to other international organizations for action and implementation. The open publicity concept ensures that all CCMS meetings are open to the press and all intergovernmental organizations.

To date, CCMS has completed over 35 studies dealing with various environmental problems of international concern. Each year about 2000 experts are involved in the various pilot study programs, of which nine are currently active. The United States is serving as the pilot country for programs on solar energy, geothermal energy, the rational use of energy, and automotive propulsion systems. Each of these programs represents part of an ongoing program being conducted domestically. For example, the $100 million domestic ERDA program on flue gas desulfurization includes costs for international work conducted under CCMS.

DECISION PROCESS FOR REACHING AGREEMENT ON IMPLEMENTING AGREEMENTS OR ANNEXES

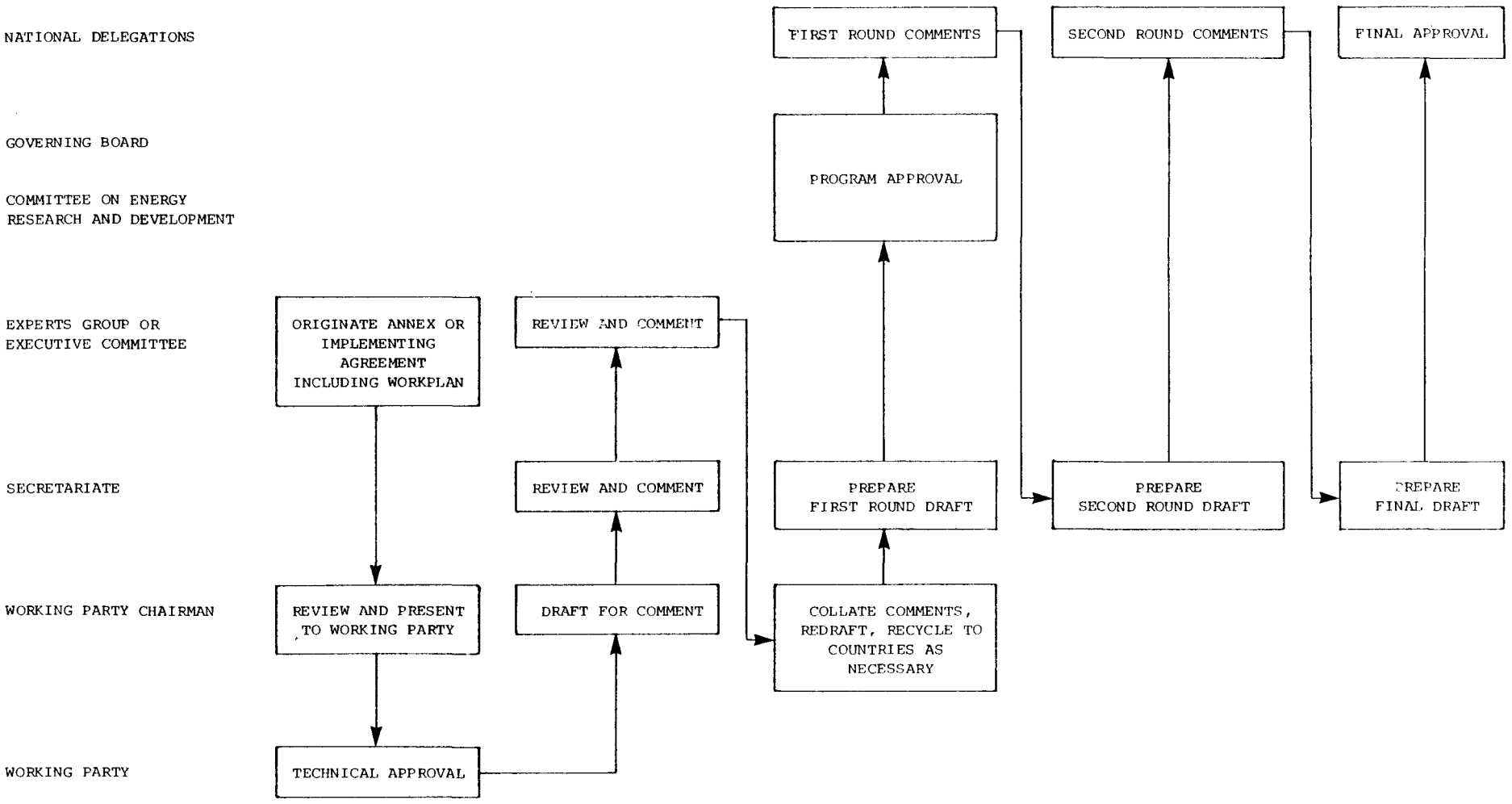


Exhibit A-2

Since CCMS studies are funded through pilot countries, minimal funds are required for ongoing activities. The total R&D funding for ongoing programs is approximately $10 million, of which approximately $300,000 is expended by the United States.

CCMS programs interface significantly with IEA projects. Since CCMS does not remain actively involved in projects for extended periods of time, a project may be turned over to IEA for further R&D or implementation. For example, the results of a cement industry study conducted as part of an industrial international data base project within the Rational Use of Energy program were communicated to IEA to initiate an R&D program based on the study's recommendations. CCMS and IEA members are working closely to develop and implement such a program. CCMS is also planning to turn over several small geothermal projects to IEA in the near future.

International Council for Buildings Research (CIB)

The International Council for Buildings Research (CIB) is an international organization of large government and private institutions engaged in buildings research. Founded about 20 years ago, it draws membership from all the advanced and some of the developing countries. Organized into working commissions, CIB includes a Working Commission on Energy Conservation in the Built Environment (W-67). The IEA Working Party on Energy Conservation R&D has made preliminary contacts with W-67 and plans to extend its collaboration with this working commission.

W-67 was formed about two years ago to examine the possibilities for conserving energy in the buildings technology area. W-67's members include representatives from all the northern European countries, and participation by the Eastern bloc countries is anticipated. The United States participates in W-67 through a delegation selected by the Building Research Advisory Board of the National Academy of Sciences/National Research Council. The United States National Committee to CIB includes representatives from trade unions, the construction industry, and academia as well as government.

The initial activities of W-67 have focused on reviewing and assessing the overall potential for energy conservation in buildings and the relative importance of specific technologies such as thermal insulation and solar energy. Regularly scheduled meetings are held for the member nations to exchange scientific information and identify new areas of research. Technology transfer is achieved through occasional conferences and International Congresses (held every four years). CIB W-67 and the Working Party on Energy Conservation R&D anticipate that common membership will result in better exchange of information about R&D programs and thereby avoid duplication of effort.

Program with the USSR

In the area of energy conservation, ERDA is cooperating with the Union of Soviet Socialist Republics (USSR) in a project on advanced electrical transmission (super-conduction) under the 1974 U.S.-USSR Energy Agreement.

APPENDIX B

MEMBERSHIP OF THE WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT

MEMBERSHIP OF THE WORKING PARTY ON ENERGY CONSERVATION R&D

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APPENDIX C

ANNUAL ACTIVITIES AND MILESTONES FOR DECISIONMAKING ON UNITED STATES PARTICIPATION IN THE IEA WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT

This appendix proposes a set of major annual activities and milestones through which ERDA and other federal agencies will reach timely agreement on their participation in the IEA Working Party on Energy Conservation R&D. The decisionmaking process is synchronized with ERDA's annual decision-making cycle. It is difficult to synchronize the process with IEA decision-making since the Working Party and experts groups will not schedule frequent or regular meetings once the initial group of implementing agreements are signed. The Working Party will probably meet once or twice a year; the executive committee and experts groups will meet somewhat more frequently, depending on the requirements of their projects. The ERDA schedule will influence the scheduling of these meetings as much as anything else.

The annual activities and milestones in the ERDA and overall federal planning and programming cycles that must be recognized in the decision-making process relating to working party projects include the following:

- Development of Spring Planning Projections for future programs, for submission to the Office of Management and Budget (OMB) in late May. Following review by OMB, these projections serve as major inputs to the preparation of ERDA's annual budget and national plan.

- Preparation of the draft ERDA budget and national plan for submission to OMB on October 1. The plan includes proposed energy RD&D by other federal agencies as well as ERDA.

- Submission of the ERDA budget and plan to Congress for review in early January.

- Development of Program Approval Documents (PAD) in mid-year for programs to be conducted beginning October 1.

These events are diagrammed in Exhibit C-1, which traces the ERDA program from initial development of the national plan and budget, through Congressional review, and finally through execution. Almost three fiscal years elapse during this process.

Exhibit C-2 delineates the activities and milestones required over two calendar years to develop and execute an annual program for United States participation in the Working Party on Energy Conservation R&D. These activities and milestones are shown in parallel with those for ERDA, with the interfaces indicated. In January, ERDA begins to solicit ideas or opportunities for working party projects from ERDA offices and other federal agencies.

ACTIVITIES AND MILESTONES IN THE DEVELOPMENT OF AN ERDA PROGRAM

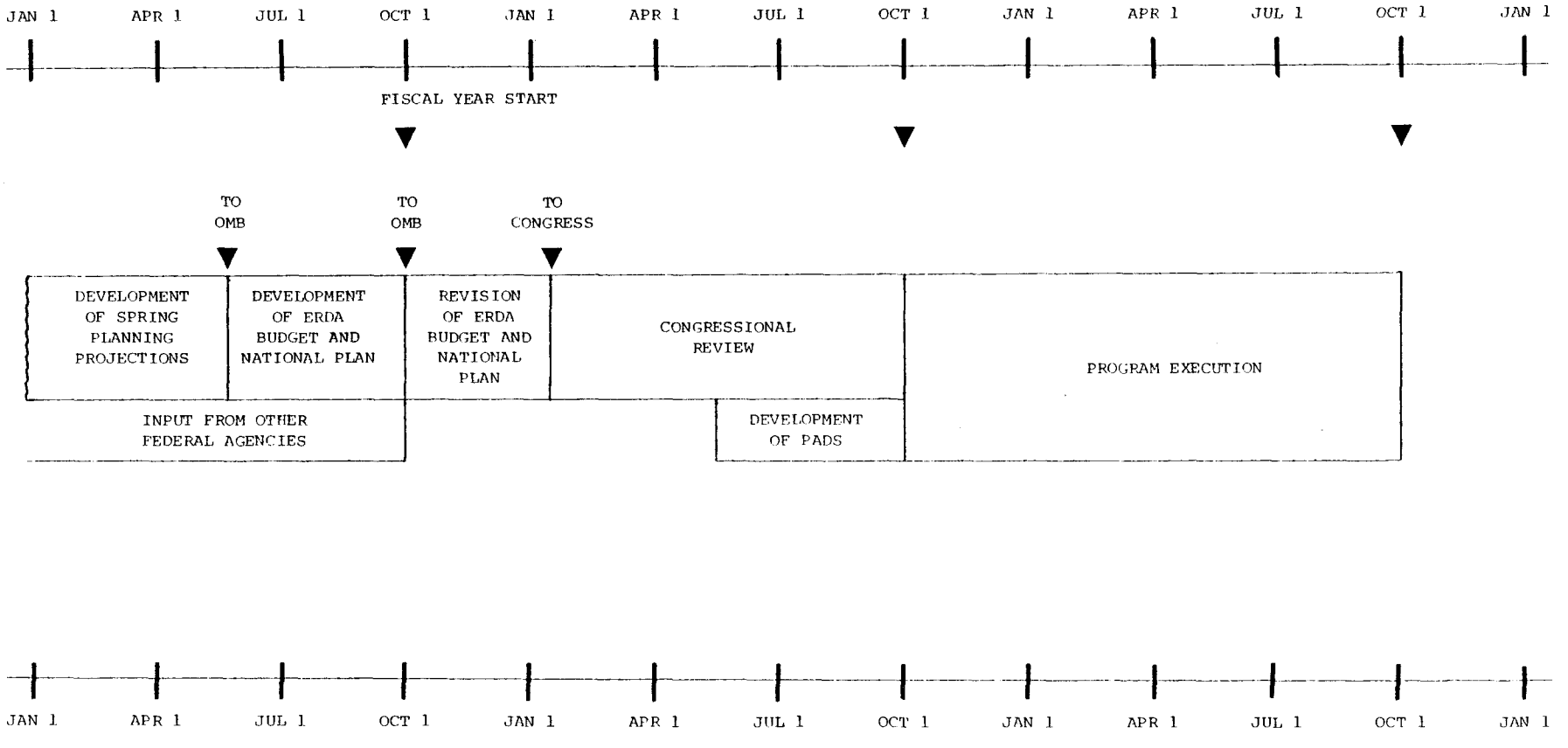
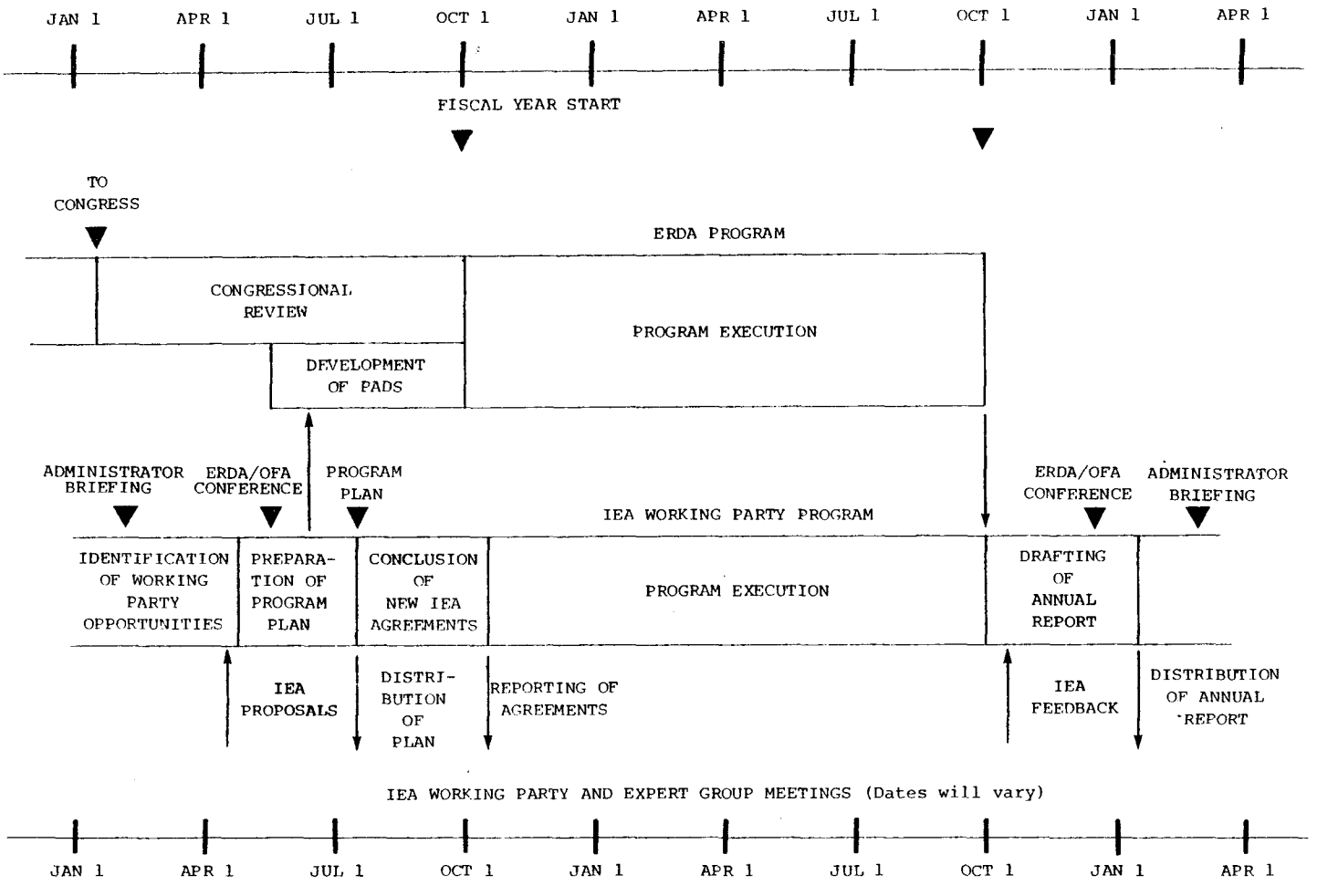


Exhibit C-1

ACTIVITIES AND MILESTONES FOR DECISION MAKING ON UNITED STATES PARTICIPATION IN THE WORKING PARTY ON ENERGY CONSERVATION R&D



On about May 15, a conference of ERDA and other interested federal agencies is held to decide on the total United States participation in the working party. The priorities and proposals of other IEA member nations serve as important input to this conference. The conference results serve in turn as an important input to the development of PADs within ERDA and equivalent documents in other agencies. The program plan for United States participation in the working party (this document) is then updated based on the conference and distributed to the IEA.

During the summer, ERDA and the other federal agencies involved seek agreement from other IEA member nations on new implementing agreements and annexes. These agreements should be concluded by the time the federal fiscal year begins.

At the end of the fiscal year, ERDA drafts an annual report to document the results of the year's research. Comments received from other IEA member nations serve as important input to this report. The draft report is then reviewed and comments are incorporated at a second conference between ERDA and other federal agencies, held on or about December 15. The annual report is then distributed to the IEA member nations.

The annual report serves as major input to a briefing for the ERDA Administrator, which takes place at the end of January (after ERDA's budget and plan are delivered to Congress). In the briefing, ERDA staff summarize working party accomplishments over the last year and solicit direction for future programs. The Administrator's comments at the briefing are an important input to the next planning cycle for United States participation in the working party. The milestone for the Administrator's briefing is shown twice in Exhibit C-2 to emphasize its dual role as a milestone for reporting past performance and for setting future policy.

The U.S. Chairman of the Working Party on Energy Conservation Research and Development and the U.S. delegates have complementary responsibilities in the above process. The Chairman is responsible for organizing and chairing meetings of the working party; coordinating working party activities with other IEA bodies and the IEA Secretariat; administering and expediting new implementing agreements and annexes; monitoring ongoing programs to ensure smooth operation; and preparing the annual report of working party activities. The U.S. delegates are responsible for representing their program areas on the working party and for developing and conducting ERDA/IEA programs in these areas.

APPENDIX D

CURRENT ERDA COMMITMENTS TO THE IEA WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Buildings & Community Systems IMPLEMENTING AGREEMENT (STATUS) Agreement expected 2/1/77

PROJECT TITLE Comparison of Building Energy Analysis Programs ANNEX (STATUS) Agreement expected 2/1/77

PROGRAM PERIOD 10/76-7/77

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems, Division of Buildings & Community Systems

ERDA PAD REFERENCE Buildings & Community Systems

PARTICIPANTS Austria, Canada, Federal Republic of Germany, Sweden, Switzerland, United Kingdom, United States

PROJECT DESCRIPTION:

This project will consist of two tasks: (1) gather data on important international techniques for analyzing energy loads and usage in buildings and building systems components, and publish the results; (2) develop standard test buildings and building equipment descriptions for evaluating analysis techniques and programs, and publish the results. The end-products of the project will include: (1) bibliography of international techniques for analyzing energy loads and usage in buildings and building equipment; (2) identification of the standard test buildings and equipment, including weather information; and (3) results of applying analysis programs and techniques to test buildings and equipment. Initial steps have been taken to jointly develop an open windows analytical program.

RATIONALE FOR U.S. INVOLVEMENT:

Common analytical basis to enhance international commerce in energy conservation materials and equipment.

U.S. FINANCIAL CONTRIBUTION: Expenses depend upon programs analyzed. The United States will provide test building design and weather tapes.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

Expenses depend upon programs analyzed.

PROJECT STATUS:

Test buildings and equipment were selected in October 1976, as well as a set of weather tapes. The test building description and weather tapes were sent to participants in early January 1977, and analysis is underway.

OBJECTIVES FOR 1977:

Complete initial comparisons by end of March 1977. Start on RD&D for open windows analytical technique.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Agree on test buildings	Z			
Apply analysis programs to test buildings	———			
Meet to discuss results		5/77 Z		
Develop open windows analytical program		———		

Legend:

O indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Buildings & Community Systems IMPLEMENTING AGREEMENT (STATUS) Agreement 10/76

PROJECT TITLE Demonstration of Systems Science of Ekistics ANNEX (STATUS) Agreement 10/76

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems, Division of Buildings & Community Systems ERDA PAD REFERENCE Buildings & Community Systems

PARTICIPANTS Greece, United States

PROJECT DESCRIPTION: The participants in this project will develop a methodology for designing an energy-efficient community based on the concept of ekistics with the energy parameter added to the overall ekistics model. At the conclusion of the project, a conference on energy and ekistics will be held to present the project results.

U.S. TASKS: ERDA will provide the operating agent with information on advanced community energy systems that have potential application in new communities. In conjunction with the ATMES (U.S.) program staff, the National Energy Council, and the operating agent, ERDA will define the community energy system to serve each of three alternative land use/development plans. The end-products will include international conference and associated conference proceedings.

RATIONALE FOR U.S. INVOLVEMENT: Applying science of ekistics to community development.

U.S. FINANCIAL CONTRIBUTION: $150,000

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: $50,000

PROJECT STATUS: The Greek government has selected subcontractors and work has been initiated.

OBJECTIVES FOR 1977: Complete model. Hold conference on ekistics during latter part of year. (For technical reasons, conference may have to be scheduled for early 1978.)

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Develop methodology	
Conduct conference	X

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

ROJECT AREA Buildings & Community Systems

PROJECT TITLE Wiehl-Esslingen demonstration

IMPLEMENTING AGREEMENT (STATUS) Signed

ANNEX (STATUS) Eventually this project will become an annex to the overall implementing agreement.

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton Assistant Director, Community & Building Energy Systems, Division of Buildings & Community Systems

ERDA PAD REFERENCE Buildings and Community Systems

PARTICIPANTS Federal Republic of Germany, United States

PROJECT DESCRIPTION:

Wiehl Demonstration. This program consists of operating tests, analyses, and technological studies and evaluations of the energy systems in a multi-purpose community recreational facility. These systems include waste heat utilization, heat recovery from wastewater and ventilation exhaust, wastewater utilization, heat loss reduction, solar energy collection, and heat pumps.

Esslingen Demonstration. This program consists of a three to five year performance evaluation of a central water-to-water heat pump system in three high-rise apartment buildings. The performance of the heat pump system will be compared to that of an oil-fired heating system for the same buildings. In addition, the project will evaluate the efficiency of alternative heat delivery systems (floor heating vs. radiator heating), and the effects of two different thicknesses of exterior wall insulation.

The end-products of these programs will be:

Wiehl:
(a) Preliminary and final report of winter operating season (due January;May)
(b) Preliminary and final report of summer operating season (due July;October)

Esslingen:
(a) Semi-annual report of evaluation of operations for 7/1-12/31 in January of each year
(b) Semi-annual report of evaluation of operations for 1/1-6/30 and for the year, in July of each year.

U.S. FINANCIAL CONTRIBUTION: $240,000(Initial)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: The Federal Republic of Germany's initial investment in the project is about $5,000,000. In addition, the FRG plans to spend 3,160,000 Deutschmarks over 3-year period, with separate budgets for Wiehl and Esslingen

PROJECT STATUS: Both sites are operational. Data collection is being conducted manually pending receipt and installation of automatic equipment in calendar year 1977.

OBJECTIVES FOR 1977: Complete initial test runs; install automatic data collection systems at Wiehl and Esslingen. Define the expanded evlauation program.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Collect data (Wiehl)	———
Perform instrumentation (Esslingen)	—
Collect data (Esslingen)	———
Evaluate winter operations (Wiehl)	Z Z Z
Evaluate summer operations (Wiehl)	Z Z Z
Evaluate first half-year operation (Esslingen)	Z Z Z
Evaluate second half-year operations (Esslingen)	Z Z Z

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Heat Pumps

IMPLEMENTING AGREEMENT (STATUS) Agreement expected 2/77

PROJECT TITLE Heat Pumps Systems with Thermal Storage

ANNEX (STATUS) Agreement expected 2/77

PROGRAM PERIOD 3 yrs. (1976-1979) with possible extension

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton Assistant Director, Community & Building Energy Systems, Division of Building & Community Systems

ERDA PAD REFERENCE Buildings & Community Systems

PARTICIPANTS Austria, Canada, Denmark, Federal Republic of Germany, Ireland, United Kingdom, United States, New Zealand, Sweden, European Community

PROJECT DESCRIPTION: This project involves the collection and exchange of basic data regarding development programs for heat pumps with storage. The scope of work includes heat pump systems with thermal storage for the generation of domestic heat and/or cooling using the compression cycle. The end-products will be reports filed by the participating countries (see attached sheet for projects in individual countries).

U.S. TASKS: Provide information on the ongoing ACES program.

RATIONALE FOR U.S. INVOLVEMENT: Broaden the technology base without having to duplicate work done elsewhere.

U.S. FINANCIAL CONTRIBUTION: Nothing above the ongoing ACES program.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: No funds transfers will occur between countries.

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Reach agreement on annex	
Exchange information	

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

AUSTRIA:	Minergy-House No. 1 at Schönau near Vienna: air-to-water heat pump for floor heating with gravel bed storage below ground as a heat source during the coldest part of the season.
CANADA:	At least one project with a heat pump in connection with a thermal storage system within the Federal Program concerning solar energy. Furthermore, a project of the Department of Energy, Mines and Resources with the aim to establish the feasibility of a ground storage system.
DENMARK:	Evaluation of the projects contributed by the other participating countries. Preparation and publication of reports (in cooperation with operating agent).
GERMANY, F.R.:	Heat Pump system with thermal storage (ice-storage) for a home on the Rhine near Karlsruhe.
IRELAND:	Air source heat pump system with short-term water-storage units to possible space and water heating requirements of a typical domestic unit (University College, Galway).
UK:	Experimental low-energy house at Building Research Station, Watford, Herts., which has a solar collector linked to thermal storage using three heat pumps: one to upgrade heat from a solar collector into storage; one to upgrade heat from storage into the space-heating system; and one to upgrade heat from storage into the domestic hot water system.
USA:	Demonstration project, designed to demonstrate the capability of the Annual Cycle Energy System (ACES) at Oak Ridge National Laboratory, Oak Ridge, Tennessee. The principal component of this system is an insulated tank of water which serves as a thermal storage bin. In winter, heat is obtained by a heat pump, which also turns the water in the bin into ice, over a period of months. In summer, the chilled water is used to provide air conditioning without the operation of the heat pumps compressor.
EC:	Possible participation.
SWEDEN:	Participation considered.
NEW ZEALAND:	Participation considered.

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Energy Cascading

IMPLEMENTING AGREEMENT (STATUS) Agreement expected 2/77

PROJECT TITLE Common Study

ANNEX (STATUS) Agreement expected 2/77

PROGRAM PERIOD 2 years; 2/77-2/79

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems, Division of Buildings & Community Energy Systems

ERDA PAD REFERENCE Buildings & Community Systems

PARTICIPANTS Austria, FRG, the Netherlands, Sweden, Switzerland, United Kingdom, United States

PROJECT DESCRIPTION: The participants in the project will: (1) identify energy cascading technologies; (2) identify energy needs which might be served by specific energy wastes; (3) determine the applicability of specific cascading technologies in matching energy wastes to energy needs; (4) determine economic and other factors that might affect commercialization of cascading technologies; (5) identify specific R&D projects for consideration by ERDA and IEA, and prepare specific annexes; and (6) prepare a detailed program plan for this RD&D. The end-products will include: (1) final plan for the common study, containing a work plan for each participating country; (2) report on applicable energy cascading technologies and energy savings related to each in each country and industrial sector; (3) report on the energy cascading technologies which are economically feasible in each country; (4) program plan for RD&D in energy cascading containing those energy cascading technologies offering the best RD&D opportunities; and (5) annexes for the initial RD&D projects to be undertaken and IEA.

RATIONALE FOR U.S. INVOLVEMENT: Maximize data base for minimum investment.

U.S. TASKS: The U.S. will be the operating agent.

U.S. FINANCIAL CONTRIBUTION: $250,000

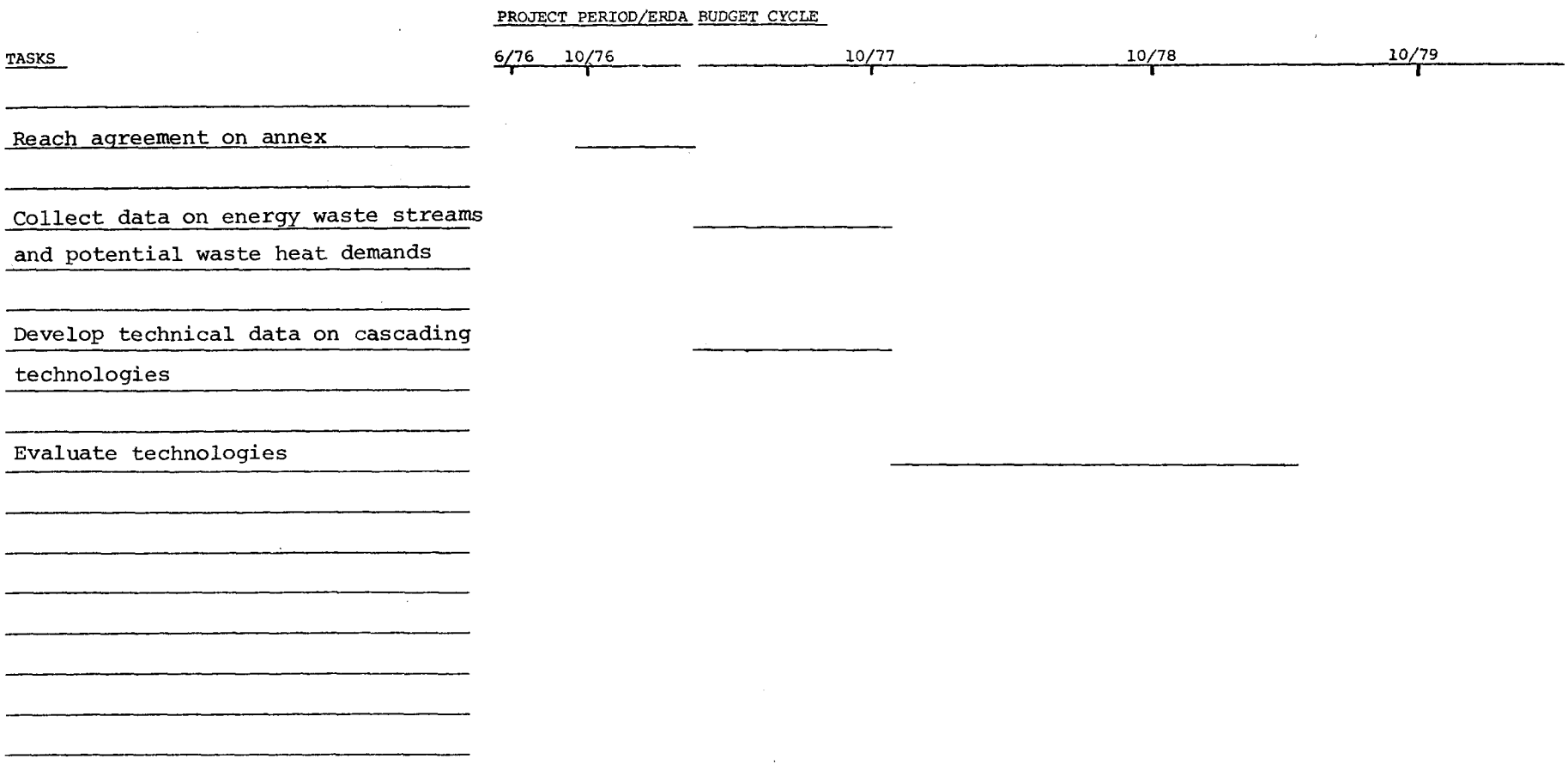
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: $250,000

PROJECT STATUS: Although an agreement has not been reached on specific items to be covered in the first studies, areas of interest include: (1) treble Rankine cycle process; (2) total integrated energy systems; (3) recovery of industrial flue gas heat with Brayton cycle; (4) Rankine engine to recover heat from a diesel truck engine.

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Heat Transfer

PROJECT TITLE Optimal Design of Heat Exchanger Networks

U.S. PROGRAM MANAGER/DIVISION

IMPLEMENTING AGREEMENT (STATUS) To be signed in Octobe.

ANNEX (STATUS) To be approved in October.

PROGRAM PERIOD 2 years

ERDA PAD REFERENCE Conservation Research & Technology

PARTICIPANTS Sweden, UK

PROJECT DESCRIPTION:

The project consists of the following tasks: (1) review and assess the various optimization methods available and published case studies; (2) test available computer programs and assess their relevance to industrial applications; (3) prepare case studies of industrial applications; and (4) investigate the application of heat exchanger optimization techniques in one or more case studies with the cooperation of Swedish industry.

U.S. TASKS:

FOR INFORMATION ONLY: THE U.S. IS NOT A PARTICIPANT IN THIS STUDY.

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION:

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
No specific information on schedules				

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Heat Transfer

PROJECT TITLE Excended surfaces

U.S. PROGRAM MANAGER/DIVISION

IMPLEMENTING AGREEMENT (STATUS) Expected by Nov. 1

ANNEX (STATUS) Expected by Nov. 1

PROGRAM PERIOD 3 years

ERDA PAD REFERENCE Conservation Research and Technology

PARTICIPANTS Sweden, United Kingdom

PROJECT DESCRIPTION:

The project will involve two major tasks. The first, mezanistic studies of the performance of extended surface heat transfer systems, with theoretical and experimental studies of conjugated convection and conduction problems, related to extended surface heat transfer. The second, studies of the performance of practical extended surface systems, will include studies of finned tube heat transfer, tube-in-tube heat exchangers, air-cooled heat exchangers, particulate fouling of finned tube systems, and the effects of pulsations on heat transfer coefficients.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

— FOR INFORMATION ONLY: THE U.S. IS NOT A PARTICIPANT IN THIS STUDY —

U.S. FINANCIAL CONTRIBUTION:

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
No specific information on schedules	

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Heat Transfer

IMPLEMENTING AGREEMENT (STATUS) Agreement expected 11/1/76

PROJECT TITLE Heat Exchanger Tube Vibration

ANNEX (STATUS) Agreement expected by 11/1/76

PROGRAM PERIOD 3 years; 9/1/76 - 9/1/79

U.S. PROGRAM MANAGER/DIVISION Michael Perlsweig, Acting Chief, Thermodynamics and Heat Transfer, Branch Division of Conservation Research and Technology

ERDA PAD REFERENCE Conservation Research and Technology

PARTICIPANTS Sweden, United Kingdom, United States

PROJECT DESCRIPTION:

This project has five tasks: (1) experimental studies of fluid elastic whirling of cantilevered elements in tube banks, (2) integrated theoretical/experimental studies of fluid structure coupling in tube banks, (3) turbulent buffeting studies, (4) measurement of damping and frequency in multi-span assemblies, and (5) international conference. The end-products of the studies will be proceedings of the conference, and a proprietary report on heat exchange tube vibration.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT: The U.S. is seeking to benefit from ongoing research in the United Kingdom, Sweden, and Switzerland. Only information exchange is contemplated.

U.S. FINANCIAL CONTRIBUTION: $400,000 (over 3 years)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: $170,000

PROJECT STATUS: Workshop has been held. Participants are reviewing proceedings (in draft form).

OBJECTIVES FOR 1977: Develop ERDA R&D plan and begin experimental work.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Conduct workshop	X
Develop conference report, including state-of-the-art survey	4/1
Develop U.S. proposal R&D plan for remainder of three-year agreement	2/1
Agree on joint R&D plan for remainder of three-year agreement	4/1
Cooperation research (with information exchange)	4/1

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Combustion

IMPLEMENTING AGREEMENT (STATUS) Draft is circulating

PROJECT TITLE Combustion processes

ANNEX (STATUS)

PROGRAM PERIOD 3 years; 1976-1979

U.S. PROGRAM MANAGER/DIVISION Dr. Karl Bastress, Chief, Combustion and Fuels Technology, Branch Division of Conservation Research and Technology

ERDA PAD REFERENCE Conservation Research and Technology

PARTICIPANTS Sweden, United Kingdom, United States (others invited to join)

PROJECT DESCRIPTION:

Three major task areas with specific subtasks have been defined: (1) combustion system modeling; (2) instrumentation and studies of fundamental processes in combustion; and (3) resource exchange. The objective of the first task area is to develop predictive techniques for use in the design and analysis of combustion engines and furnaces. The objectives of the second area are to develop diagnostic techniques for a combustion process and to characterize fundamental combustion processes. The objective of the third area is to establish mechanisms for the exchange of information on research programs and facilities. The task areas have been defined in broad terms to allow participating countries to initiate additional subtasks as the project progresses.

U.S. TASKS: 1. Experimental methods for IC engines. 2. Performance model for IC engines. 3. LDA velocity measurement system. 4. Raman spectroscopic temperature and composition measurement system. 5. Standard experiments. 6. Combustion abstracts. 7. Facility inventory.

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION: $300,000 (CY '77), $420,000 (CY '78), $600,000 (CY '79)

$1,320,000 over 3 years

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

	CY 77	78	79
United Kingdom	50,000	70,000	100,000
Sweden	5,000	8,000	10,000

PROJECT STATUS:

Work plan in preparation.

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Prepare work plan					
Perform research tasks					

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

APPENDIX E

PLANNED ERDA INVOLVEMENT WITH THE IEA WORKING PARTY ON ENERGY CONSERVATION RESEARCH AND DEVELOPMENT

ERDA Priorities for Future IEA Research

The ERDA program managers responsible for conducting research under ERDA PADs have established priorities for future energy R&D. Their research priorities will form the basis of any new proposals developed by ERDA for consideration at IEA meetings. In most cases, these planned program areas closely parallel ongoing research in the current ERDA program. The ERDA program managers are interested in discussing possible joint efforts with research managers in other countries who are pursuing research in related areas.

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA BUILDINGS & COMMUNITY SYSTEMS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEMONSTRATION OF ENERGY-EFFICIENT BUILDING DESIGNS & COMPONENTS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems

ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

Projects are possible in at least four areas: (1) window placements, (2) lighting systems, (3) construction materials, and (4) mechanical systems. Decisions on initial projects will depend on negotiations with other countries.

U.S. TASKS: Sponsor certain component or hardware demonstrations jointly in the United States or Europe.

RATIONALE FOR U.S. INVOLVEMENT: Opportunity to learn about advanced equipment and evaluation techniques in other countries.

U.S. FINANCIAL CONTRIBUTION: To be determined.

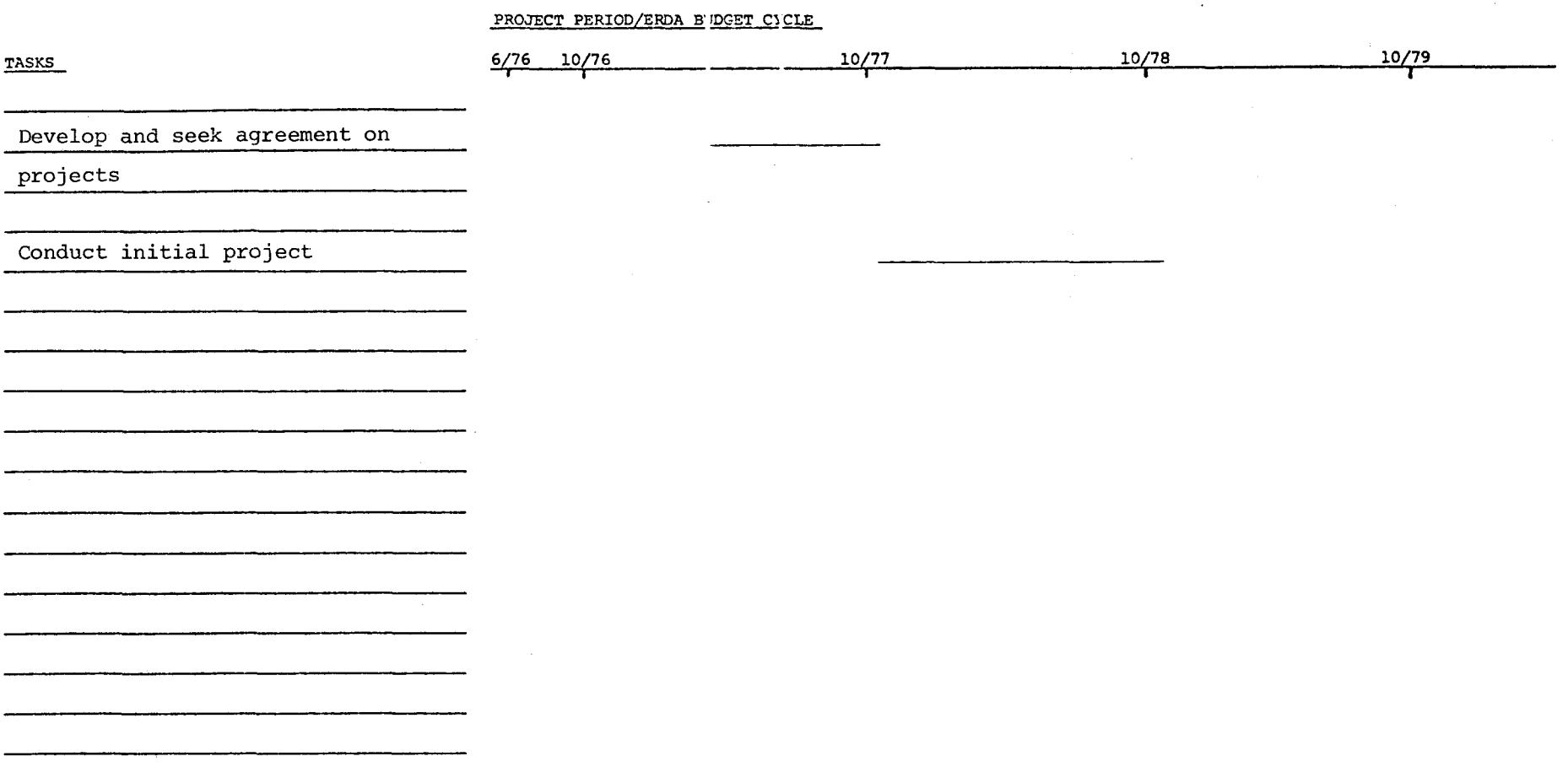
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Buildings & Community Systems IMPLEMENTING AGREEMENT (STATUS) _____

PROJECT TITLE Development of Standard Building Energy Load & Usage Analysis Techniques ANNEX (STATUS) _____

PROGRAM PERIOD _____

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Buildings Energy Systems ERDA PAD REFERENCE Buildings & Community Systems

PARTICIPANTS _____

PROJECT DESCRIPTION: This project will involve developing jointly an analytical technique to understand the load and energy parameters of a building utilizing natural ventilation.

U.S. TASKS: Cosponsor the development of such an analytical technique.

RATIONALE FOR U.S. INVOLVEMENT: The development of analytical techniques and the verification of such techniques is a long and expensive process. Experience in open windows buildings is more widespread in Europe than in the United States and a good technical base could be obtained for such a technical program by cooperation, in shorter time, and at less cost.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Complete annex 1 (ongoing)	
Reach agreement on proposed project	
Perform project	

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA BUILDINGS & COMMUNITY SYSTEMS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE ADDITIONAL EQUIPMENT DEMONSTRATIONS AT WIEHL & ESSLINGEN

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION GERALD S. LEIGHTON ASST. DIR., COMMUNITY & BUILDINGS ENERGY SYSTEMS

ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will be a continuation of the work currently under way.

U.S. TASKS:

Cosponsor demonstrations and test innovative energy equipment at Wiehl and Esslingen.

RATIONALE FOR U.S. INVOLVEMENT:

Same as for current involvement.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Reach agreement on proposed new demonstrations		———			
Perform demonstrations			———	———	

Legend:

- ○ indicates preliminary report or product design
- △ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Building & Community Systems IMPLEMENTING AGREEMENT (STATUS) _____

PROJECT TITLE Evaluation of District Heating Systems ANNEX (STATUS) _____

PROGRAM PERIOD _____

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Buildings Energy Systems ERDA PAD REFERENCE Buildings & Community Systems: Nuclear Research and Applications

PARTICIPANTS _____

PROJECT DESCRIPTION: This project may be either a continuation of present cooperative work with Sweden, funded through ERDA and Oak Ridge National Laboratory, or a contribution to a multinational analysis performed by Battelle/Frankfort.

U.S. TASKS: Develop technical evaluations and implementation case studies of district heating technologies in use or under development in Europe.

RATIONALE FOR U.S. INVOLVEMENT: European nations are considerably ahead of the U.S. in resolving important technical barriers to implementing district heating technology.

U.S. FINANCIAL CONTRIBUTION: To be determined.

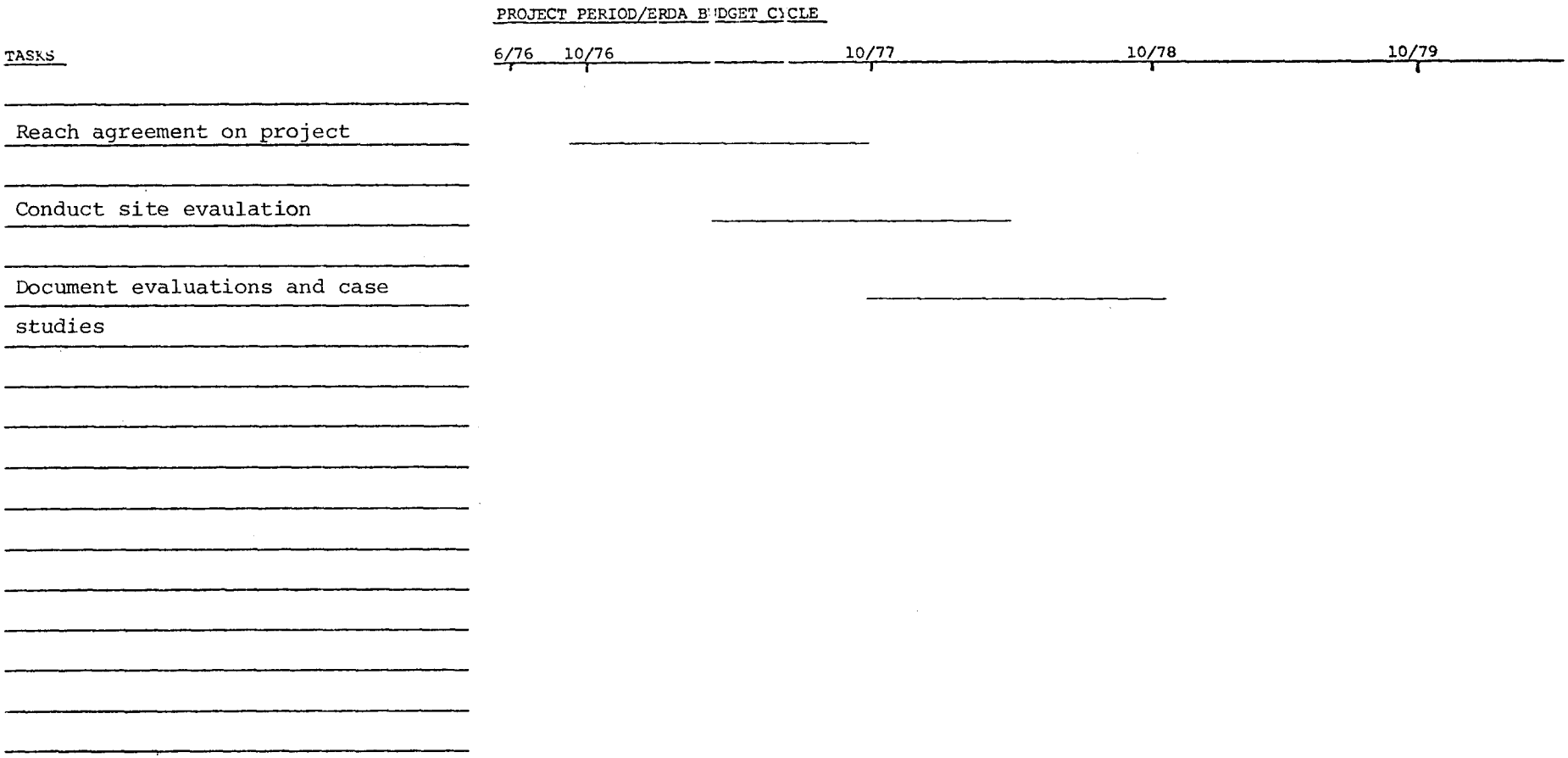
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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- △ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Buildings & Community Systems IMPLEMENTING AGREEMENT (STATUS) _____

PROJECT TITLE Grid-Connected Total Energy Systems ANNEX (STATUS) _____

PROGRAM PERIOD _____

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems ERDA PAD REFERENCE Building & Community Systems

PARTICIPANTS _____

PROJECT DESCRIPTION: Demonstration of advanced grid-connected total energy systems based on diesel engines. The work will be a collaboration between ERDA and RWE, the major West German electric utility. The project will build on current efforts by both RWE (grid-connected 250 kW engines) and ERDA (larger diesel equipment).

RATIONALE FOR U.S. INVOLVEMENT: To capitalize on German experience in total energy systems based on small diesel engines.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT: To be determined.

PROJECT STATUS:

OBJECTIVES FOR 1977: Reach an agreement on specific project.

Date _____

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Reach agreement on project					
Conduct project					

Legend:

O indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA Building & Community Systems

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE MIUS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION Gerald S. Leighton, Assistant Director, Community & Building Energy Systems

ERDA PAD REFERENCE Building & Community Systems

PARTICIPANTS

PROJECT DESCRIPTION: The project will be a continuation of the CCMS work on MIUS, which developed an inventory of international data and methodologies for evaluating integrated utility systems for communities. This library data will be maintained, updated, and specific joint demonstration activities will be determined at a future date.

U.S. TASKS: (see above)

RATIONALE FOR U.S. INVOLVEMENT: Follow-on to preliminary analysis of the treble Rankine cycle contained in annex 1 of the implementing agreement on energy cascading.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Reach agreement on project					
Execute project					

Legend:

- ○ indicates preliminary report or product design
- △ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA BUILDINGS & COMMUNITY SYSTEMS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE SITE-SPECIFIC DEMONSTRATIONS OF EKISTICS METHODOLOGY

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION STEVE CAVROS, ACTING CHIEF, COMMUNICATIONS SYSTEMS BRANCH, BUILDINGS & COMMUNITY SYSTEMS

ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve applying the energy-ekistics methodology (developed in annex 2) to a specific site.

U.S. TASKS:

Cosponsor application of the methodology to sites in Greece and the U.S.

RATIONALE FOR U.S. INVOLVEMENT:

To gain experience with a sophisticated planning methodology not presently used in the U.S.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Complete annex 2				
Perform site-specific applications				

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA BUILDINGS & COMMUNITY SYSTEMS IMPLEMENTING AGREEMENT (STATUS) _____

PROJECT TITLE DEMONSTRATIONS OF BIOCONVERSION TECHNOLOGIES ANNEX (STATUS) _____

PROGRAM PERIOD _____

U.S. PROGRAM MANAGER/DIVISION GERALD S. LEIGHTON ASST. DIR., COMMUNITY & BUILDINGS ENERGY SYSTEMS ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS

PARTICIPANTS _____

PROJECT DESCRIPTION:

Bioconversion technologies such as anaerobic digestion and enzymatic hydrolysis will be analyzed under this project.

RATIONALE FOR U.S. INVOLVEMENT:

Opportunity to learn about advanced bioconversion techniques, distribute the cost of evaluating bioconversion projects ongoing in the United States and, with European involvement, perhaps develop an exportable technology.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Reach agreement on project	———			
Perform project		———		

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA HEAT PUMPS

PROJECT TITLE DEVELOPMENT OF NEW OPERATING FLUIDS FOR HEAT PUMPS

U.S. PROGRAM MANAGER/DIVISION MICHAEL PERLSWEIG, CHIEF, THERMODYNAMICS & HEAT TRANSFER DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

IMPLEMENTING AGREEMENT (STATUS)

ANNEX (STATUS)

PROGRAM PERIOD

ERDA PAD REFERENCE CONSERVATION RESEARCH & TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will work toward development of a supplemental operating fluid for heat pumps to replace freon, which has some objectionable environmental qualities.

U.S. TASKS:

(see above)

RATIONALE FOR U.S. INVOLVEMENT:

Opportunity to learn about new operating fluids being developed abroad

U.S. FINANCIAL CONTRIBUTION: $60,000 (FY '78), $90,000 (FY '79), $130,000 (FY '80)

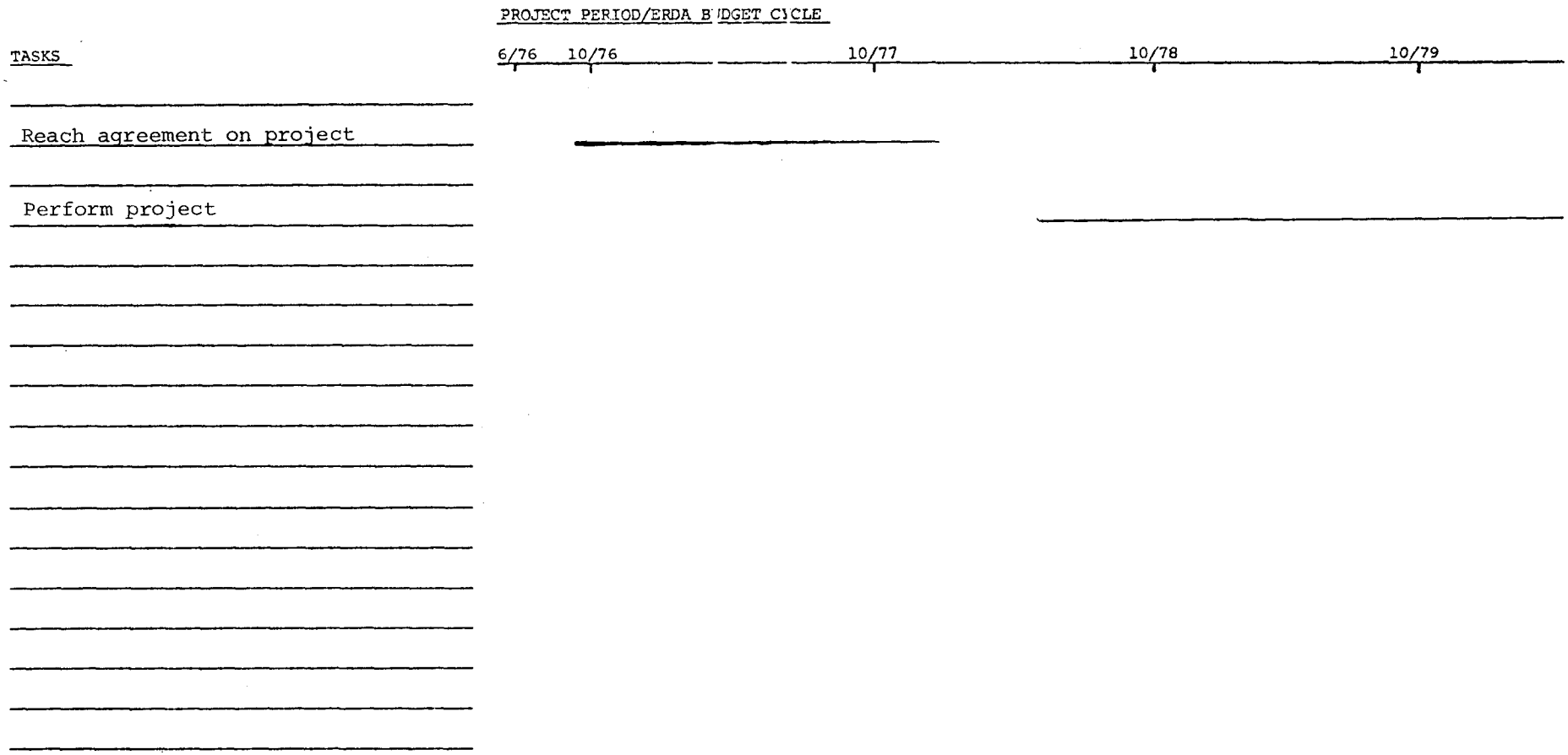
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY CASCADING

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEMONSTRATIONS OF ENERGY CASCADING IN INDUSTRY

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION DOUG HARVEY, DIV. OF INDUSTRIAL CONSERVATION (FOR ANNEX) & GERALD S. LEIGHTON (FOR AGREEMENT).

ERDA PAD REFERENCE INDUSTRIAL ENERGY CONSERVATION & ELECTRIC ENERGY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

The project will involve evaluating the technical and economic performance of Cascading technologies in actual industrial applications (e.g., topping and bottoming; Rankine and Brayton cycles; back-pressure turbines; extraction turbines).

U.S. TASKS:

Cosponsor or co-subsidize a cascading installation in Europe, including capital costs, instrumentation, and testing.

RATIONALE FOR U.S. INVOLVEMENT: To capitalize on industrial experience in Europe.

U.S. FINANCIAL CONTRIBUTION: To be determined.

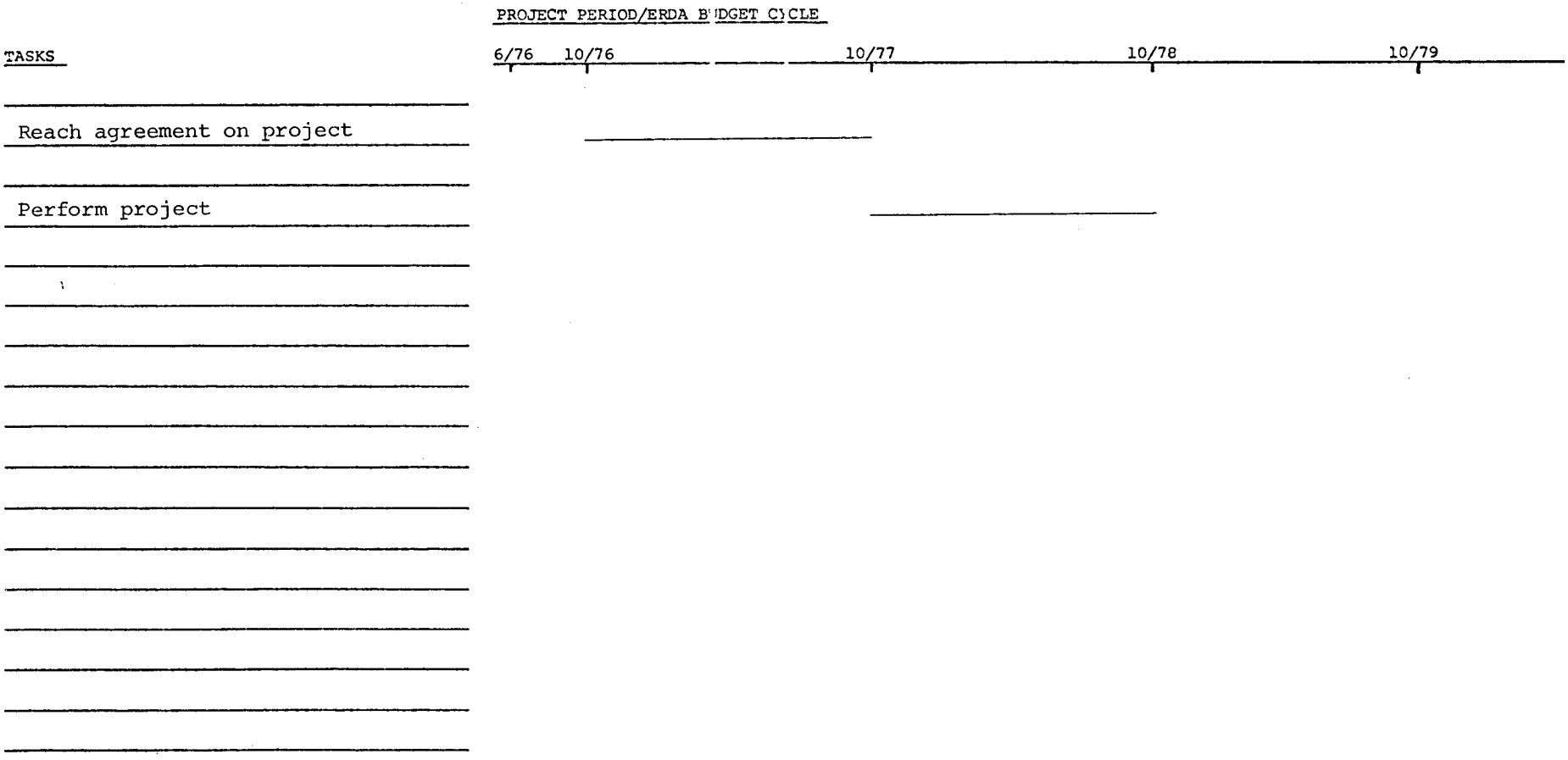
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY CASCADING

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE APPLICATIONS OF WASTE HEAT TO FOOD PRODUCTION

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION DOUG HARVEY (FOR ANNEX) AND GERALD S. LEIGHTON (FOR AGREEMENT).

ERDA PAD REFERENCE INDUSTRIAL ENERGY CONSERVATION

PARTICIPANTS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK: Two areas of food production will be investigated: (1) aquaculture applications; and (2) agriculture applications.

U.S. TASKS: Cosponsor demonstrations.

RATIONALE FOR U.S. INVOLVEMENT:

To enhance food supplies worldwide.

U.S. FINANCIAL CONTRIBUTION: $75,000 (FY '78)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

NOTES: The Federal Republic of Germany has programs in this area.

PROJECT STATUS:

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Reach agreement on project					
Perform project					

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY CASCADING

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT OF TREBLE RANKINE CYCLE

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION GERALD S. LEIGHTON ASST. DIR., COMMUNITY & BUILDING ENERGY SYSTEMS

ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS; ELECTRIC ENERGY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK: Develop and demonstrate the applicability of a Treble Rankine Cycle to large central-station power plants.

U.S. TASKS:

(see above)

RATIONALE FOR U.S. INVOLVEMENT:

A follow-on to preliminary analysis of the Treble Rankine Cycle contained in annex 1 of the implementing agreement on energy cascading.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Austria seems to be particularly interested in this project.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Gain agreement on project				
Execute project.				

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY CASCADING

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE EDUCATIONAL PROGRAM ON ENTROPY BALANCING

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION GERALD L. LEIGHTON ASST. DIR., COMMUNITY & BUILDING ENERGY SYSTEMS

ERDA PAD REFERENCE BUILDINGS & COMMUNITY SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project would involve entropy balancing (i.e., matching a fuel's available energy to the requirements of the task) and developing educational programs to teach the concept to engineering students, industrial decision-makers, and government officials.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

In the area of energy conservation, it is important to pay attention to both the entrophy and the enthalpy balancing in all energy use.

U.S. FINANCIAL CONTRIBUTION: To be determined.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

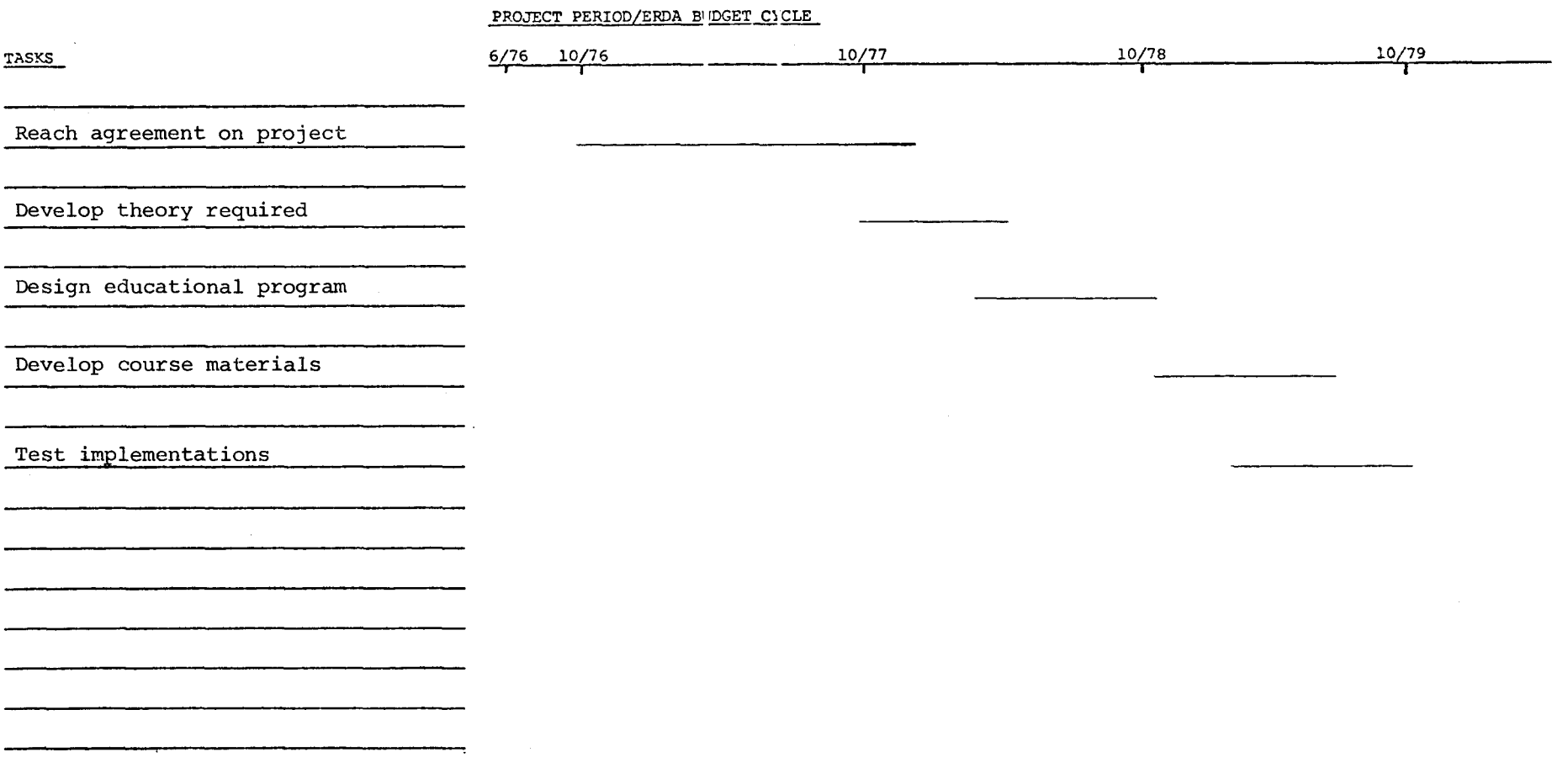
OBJECTIVES FOR 1977:

NOTES:

This project would lead to the development of course material and a program of seminars and briefings for target groups.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA HEAT TRANSFER

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE EVALUATION OF FLUIDIZED HEAT EXCHANGER FOR USE IN RANKINE CYCLE

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MICHAEL PERLSWEIG, ACTING CHIEF, THERMODYNAMICS & HEAT TRANSFER, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve conducting technical and economic feasibility evaluations of commercially available fluidized-bed heat exchangers (using English hardware), developing an improved prototype, and conducting performance and reliability tests on the improved prototype.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION: $70,000 (4/77-4/78), $100,000 (4/78-4/79), $300,000 (4/79-4/80)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

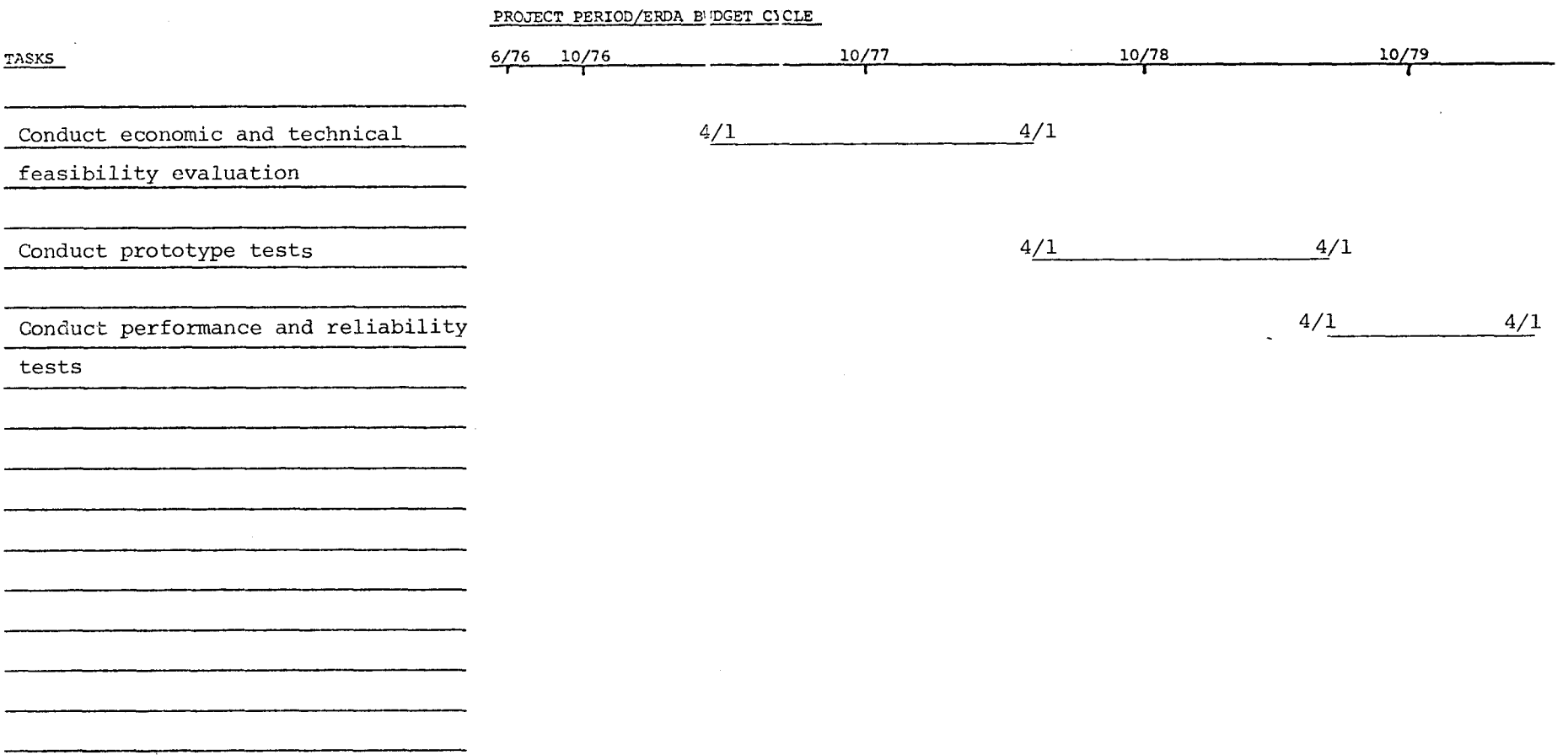
OBJECTIVES FOR 1977:

NOTES:

Patent is currently owned by an English citizen and would have to be purchased.

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA HEAT TRANSFER

PROJECT TITLE EXPERIMENTAL DETERMINATION OF FOULING FACTORS FOR CARBON ON HEAT EXCHANGERS PLACED IN WASTE HEAT EXHAUST STEAM

U.S. PROGRAM MANAGER/DIVISION MICHAEL PERLSWEIG, ACTING CHIEF, THERMODYNAMICS & HEAT TRANSFER, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

IMPLEMENTING AGREEMENT (STATUS)

ANNEX (STATUS)

PROGRAM PERIOD

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve studying fouling factors of heat exchangers in diesel and gas turbine exhaust systems.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

Potential benefit from similar European research.

U.S. FINANCIAL CONTRIBUTION: $55,000 (7/77-7/78), $55,000 (7/78-7/79)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Perform diesel exhaust fouling study	7/1 7/1
Perform gas turbine fouling study	7/1 7/1

Legend:

- ○ indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA HEAT TRANSFER

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE EXPERIMENTAL DETERMINATION OF THE DEW POINT OF SULFURIC ACID

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MICHAEL PERLSWEIG ACTING CHIEF, THERMODYNAMICS & HEAT TRANSFER, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will focus on the dew point of sulfuric acid in waste exhaust streams. The participating countries would share research results.

U.S. TASKS:

Perform an acid corrosion study.

RATIONALE FOR U.S. INVOLVEMENT:

Potential benefit from similar European research.

U.S. FINANCIAL CONTRIBUTION: $50,000

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Perform acid corrosion study	7/1 7/1

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA COMBUSTION

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE EXTENSION OF CURRENT COMMITMENTS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION KARL BASTRESS, CHIEF, COMBUSTION & FUELS TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

See current commitments

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION:

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
See current commitments	

Legend:

- ○ indicates preliminary report or product design
- △ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA COMBUSTION

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DETERMINATION OF COMBUSTION PROPERTIES OF ALTERNATIVE & MODIFIED FUELS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION DR. KARL BASTRESS, CHIEF, COMBUSTION & FUELS TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve experimental and theoretical investigations to define and measure properties of fuels relevant to the design of combustion equipment. Alternate fuels include all fuels other than petroleum-derived fuels and natural gas. The modified fuels that will be investigated include additives, blended fuels, and emulsifications of fuels.

U.S. TASKS:

Develop criteria and methods for measuring combustion properties of alternate fuels and evaluate fuel/water emulsions.

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION:

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Develop criteria and methods	
Evaluate fuel/water emulsions	

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA MATERIALS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE IMPROVED HOT PRESSING OF LARGE INDUSTRIAL TURBINE ENGINE COMPONENTS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION FRANK MOORE
ACTING CHIEF, MATERIALS & FABRICATION TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve studying hot-pressing methods for fabricating ceramic components to shape or near-shape, developing improved technology for manufacturing hot-pressing dies, and evaluating ceramic materials for use in 2800° F - 3000° F.

U.S. TASKS:

See statement of work. The materials to be studied are Si_3N_4 and SiC.

RATIONALE FOR U.S. INVOLVEMENT:

The United Kingdom and Italy have important ceramics capabilities and would like to identify cooperative research.

U.S. FINANCIAL CONTRIBUTION: $75,000 (FY'77), $100,000 (FY'78), $200,000 (FY'79)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Study hot-press ceramic stator vane	———			
Develop improved dies		———		
Evaluate hot-press rotor/turbine blade			———	

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA MATERIALS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE CHARACTERIZATION & EVALUATION OF CERAMICS FOR LARGE INDUSTRIAL UTILITY GAS TURBINES

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION FRANK MOORE ACTING CHIEF, MATERIALS & FABRICATION TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve characterizing advanced ceramics for use in hot sections of industrial gas turbines, determining mechanical properties of hot-pressed silicon nitrides and silicon carbides, and measuring physical properties/corrosion resistance of CVD Si/SiC and SiC components. This project will also involve developing advanced hot-pressed silicon nitrides, developing stable phases in the Si_3N_4-metal oxide-SiO_2 system, and determining optimum silicon nitride composition.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION: $150,000 (FY 77), $200,000 (FY 78), $200,000 (FY 78)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Characterize mechanical properties of hot-pressed silicon nitrides and silicon carbides					
Measure physical properties and corrosion resistance of CVD SiC, and Si/SiC composites					
Optimize pressing additives of SiC, Si_3N_4 for improved strength and corrosion resistance					

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA MATERIALS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT OF NON-DESTRUCTIVE METHODS FOR EVALUATING CERAMIC COMPONENTS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION FRANK MOORE, ACTING CHIEF, MATERIALS & FABRICATION TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve evaluating acoustic emission, holographic interferometry, and neutron-radiography techniques for detecting flaws in hot-pressed and reaction-bonded silicon nitride components.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

Interested in developments in this field in other countries.

U.S. FINANCIAL CONTRIBUTION: $70,000 (FY 77), $150,000 (FY 78), $150,000 (FY 79)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA MATERIALS

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT & DEMONSTRATION OF NEW PROCESSES FOR RECOVERING & PROCESSING PLASTICS FROM INDUSTRIAL & MUNICIPAL WASTES

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION FRANK MOORE ACTING CHIEF, MATERIALS & FABRICATION TECHNOLOGY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve collecting and analyzing information on recovery and conversion of plastic wastes, and developing and testing improved methods for converting these wastes to useful products.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

U.S. FINANCIAL CONTRIBUTION: $36,000 (FY 77), $50,000 (FY 78), $100,000 (FY 79)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76		10/77	10/78	10/79
Define conservation and distribution of plastic wastes						
Define state-of-the-art in separation techniques						
Evaluate advanced separation and classification methods						

Legend:

- O indicates preliminary report or product design
- Δ indicates final report or product design
- X indicates conference or symposium
- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA INDUSTRIAL PROCESSES

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT OF INSTRUMENTATION AND SOFTWARE TO MONITOR INDUSTRIAL EQUIPMENT

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MARTIN ZLOTNICK
ACTING CHIEF, CONTROLS & PROCESS EFFICIENCY,
DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve improving process diagnostics and providing a sensor for on-line control of industrial processes. The project will include, but is not limited to, developing techniques for measuring high temperatures in adverse environments (e.g., 2400° F in a cupola used for melting metals) using a fluidic thermistor, and determining other fluidic thermistor applications in the cement and glass industries.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

The European nations have important analytical capabilities in this area. The U.S. wishes to identify areas of joint interest.

U.S. FINANCIAL CONTRIBUTION: $25,000 (FY 77), $150,000 (FY 78)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Perform preliminary definition of application of thermistor to cupola	12/76 — 6/77
Perform laboratory demonstration of fluid thermistor	12/76 — 6/77
Identify other applications and program definition	—
R&D	
Execute program	—

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA INDUSTRIAL PROCESSES IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT OF IMPROVED TECHNIQUES FOR MODELING INDUSTRIAL UNIT OPERATION ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MARTIN ZLOTNICK
ACTING CHIEF, CONTROLS & PROCESS EFFICIENCY,
DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

Processes to be analyzed in this project include, but are not limited to, solid flows and stocking of furnaces; and water purification technologies.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

The European nations have important capabilities for analytical research in these areas. The U.S. wishes to identify areas of joint interest.

U.S. FINANCIAL CONTRIBUTION: $30,000 (FY 77), $150,000 (FY 78)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

Define R&D program.

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

TASKS	PROJECT PERIOD/ERDA BUDGET CYCLE 6/76 10/76 10/77 10/78 10/79
Conduct preliminary definition of tasks for solid flow and water purification	3/1
R&D	
Define program	3/1
R&D	
Execute program	

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY STORAGE

PROJECT TITLE DEMONSTRATION & EVALUATION OF IMPROVED TECHNOLOGIES FOR ELECTROLYTIC PRODUCTION OF H_2 AS A SUPPLEMENT TO NATURAL GAS

U.S. PROGRAM MANAGER/DIVISION GEORGE PEZDIRTZ, DIR., DIV. OF ENERGY STORAGE SYSTEMS

IMPLEMENTING AGREEMENT (STATUS)

ANNEX (STATUS)

PROGRAM PERIOD

ERDA PAD REFERENCE ENERGY STORAGE SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

The U.S. would like to collaborate on developments in H_2 production, with emphasis on electrolysis and thermochemical reactors.

U.S. TASKS:

The U.S. is primarily interested in information exchange (see above).

RATIONALE FOR U.S. INVOLVEMENT:

The U.S. is interested in international developments in this field.

U.S. FINANCIAL CONTRIBUTION: See ERDA program approval document (PAD).

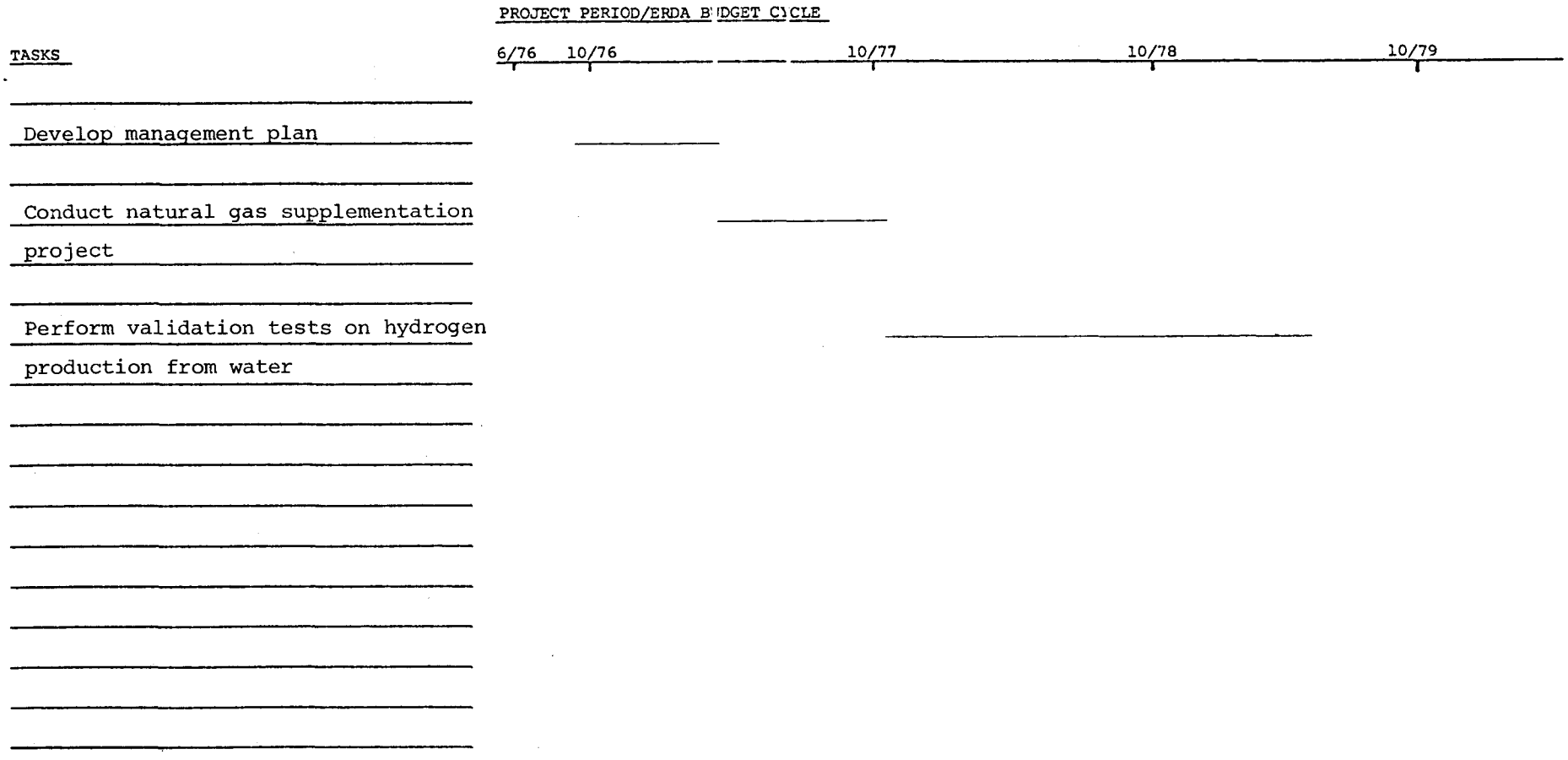
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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- Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY STORAGE

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT & TEST OF EXPERIMENTAL MOLTEN BATTERIES

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION DR. GEORGE PEZDIRTZ
DIR., DIV. OF ENERGY STORAGE SYSTEMS

ERDA PAD REFERENCE ENERGY STORAGE SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve in-vehicle tests of advanced molten batteries and information exchange among participating countries.

U.S. TASKS:

Perform in-vehicle test of lithium/metal sulfide battery and in-vehicle test of sodium/sulfur battery.

RATIONALE FOR U.S. INVOLVEMENT:

Interested in developments in batteries abroad.

U.S. FINANCIAL CONTRIBUTION: See ERDA program approval document (PAD).

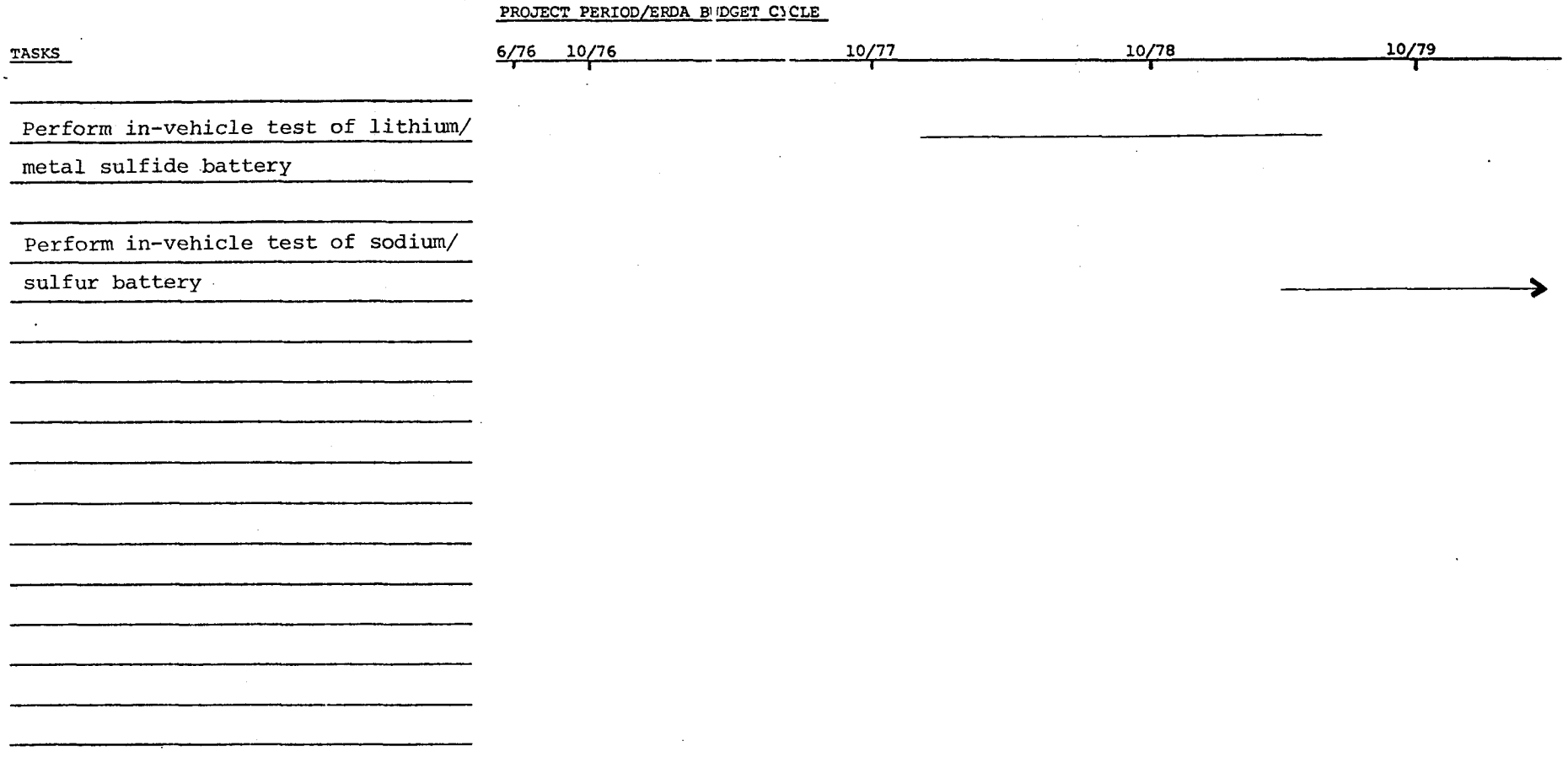
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY STORAGE

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEMONSTRATION OF A COMPRESSED AIR STORAGE FACILITY

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION DR. GEORGE PEZDIRTZ
DIR., DIV. OF ENERGY STORAGE SYSTEMS

ERDA PAD REFERENCE ENERGY STORAGE SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve exchange of information on projects to develop and demonstrate designs for compressed air storage facilities.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

Interested in developments abroad, particularly in the Federal Republic of Germany. A compressed air storage facility is operating in Hamburg.

U.S. FINANCIAL CONTRIBUTION: See ERDA program approval document (PAD).

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

PROJECT STATUS:

The U.S. may collaborate with the Federal Republic of Germany, which has a facility in Hamburg.

OBJECTIVES FOR 1977:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
Design and develop underground hydroelectric system, including test facility					

Legend:

○ indicates preliminary report or product design

Δ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY STORAGE

PROJECT TITLE DEMONSTRATION OF A FLYWHEEL STORAGE APPLICATION

U.S. PROGRAM MANAGER/DIVISION GEORGE PEZDIRTZ
DIR., DIV. OF ENERGY STORAGE SYSTEMS

IMPLEMENTING AGREEMENT (STATUS)

ANNEX (STATUS)

PROGRAM PERIOD

ERDA PAD REFERENCE ENERGY STORAGE SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve exchanging information on flywheel projects with participating countries.

U.S. TASKS:

Develop design concept for flywheel storage, and build and test a facility to test design concept.

RATIONALE FOR U.S. INVOLVEMENT:

Interested in European development.

U.S. FINANCIAL CONTRIBUTION: See ERDA program approval document (PAD).

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

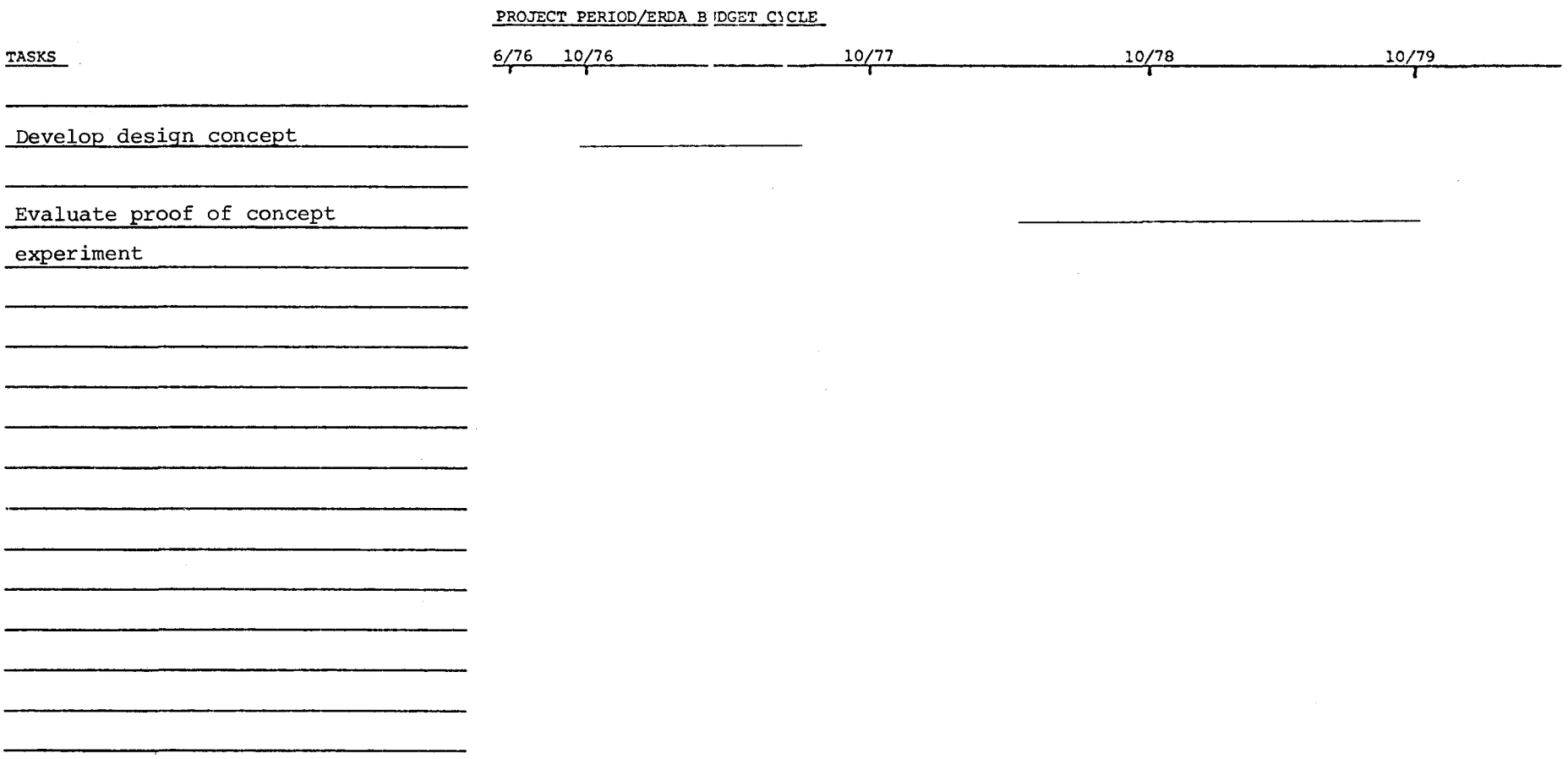
OBJECTIVES FOR 1977:

The U.S. may collaborate with Switzerland.

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA ENERGY STORAGE

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE WORKSHOPS ON ENERGY STORAGE

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION GEORGE PEZDIRTZ
DIR., DIV. OF ENERGY STORAGE SYSTEMS

ERDA PAD REFERENCE ENERGY STORAGE SYSTEMS

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

The goal of the workshops, to be held in Europe, will be to broaden the base of information dissemination and exchange beyond IEA, for certain selected topics related to energy storage.

U.S. TASKS:

Sponsor and conduct the workshop, in coordination with the host country.

RATIONALE FOR U.S. INVOLVEMENT:

See above.

U.S. FINANCIAL CONTRIBUTION: Unspecified at this time.

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76	10/76	10/77	10/78	10/79
No specific information on schedule					

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA TRANSPORTATION

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE EXPERIMENTS & MODELING OF LUBRICATION, FRICTION & WEAR IN TRACTION-DRIVES AND RECIPROCATING ENGINES

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MARTIN ZLOTNICK, ACTING CHIEF, CONTROLS AND PROCESS EFFICIENCY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

This project will involve developing the basic technology required for industry to develop improved-efficiency high-temperature (near adiabatic) reciprocating engines and continuously variable transmissions. In particular, the objectives of the project are to conduct theoretical and experimental analyses of lubricants and wear processes required to enable industry to build better engines.

U.S. TASKS:

Specific research projects will be defined by Advisory Committee from ASME.

RATIONALE FOR U.S. INVOLVEMENT:

The U.K. is particularly strong in tribology (friction, lubrication, wear). The U.S. would like to cooperate in R&D. American companies have a strong interest in this area and offer specific approaches.

U.S. FINANCIAL CONTRIBUTION: $40,000 (FY 77), $200,000 (FY 78)

CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED

PROJECT PERIOD/ERDA BUDGET CYCLE

TASKS	6/76 10/76	10/77	10/78	10/79
Develop program plan (by ASME)	7/1			
Execute program				

Legend:

○ indicates preliminary report or product design

△ indicates final report or product design

X indicates conference or symposium

Z indicates scheduled project meeting

ERDA PROGRAM PLAN FOR IEA ACTIVITIES

PROJECT AREA TRANSPORTATION

IMPLEMENTING AGREEMENT (STATUS)

PROJECT TITLE DEVELOPMENT OF IMPROVED TECHNIQUES FOR STRESS ANALYSIS OF VEHICLE TIRES & SUSPENSIONS

ANNEX (STATUS)

PROGRAM PERIOD

U.S. PROGRAM MANAGER/DIVISION MARTIN ZLOTNICK, ACTING CHIEF, CONTROLS & PROCESS EFFICIENCY, DIV. OF CONSERVATION RESEARCH & TECHNOLOGY

ERDA PAD REFERENCE CONSERVATION RESEARCH AND TECHNOLOGY

PROJECT DESCRIPTION:

SUMMARY STATEMENT OF WORK:

ASTM will assist in conducting a workshop on experimental and theoretical R&D requirements in analysis techniques for "tire architecture" and interaction with suspensions. A program will be defined and execution will begin in FY '78.

U.S. TASKS:

RATIONALE FOR U.S. INVOLVEMENT:

The European nations have important analysis capabilities in this area (e.g., Dunlop and Michelin). The U.S. would like to cooperate.

U.S. FINANCIAL CONTRIBUTION: $10,000 (FY 77), $150,000 (FY 78)

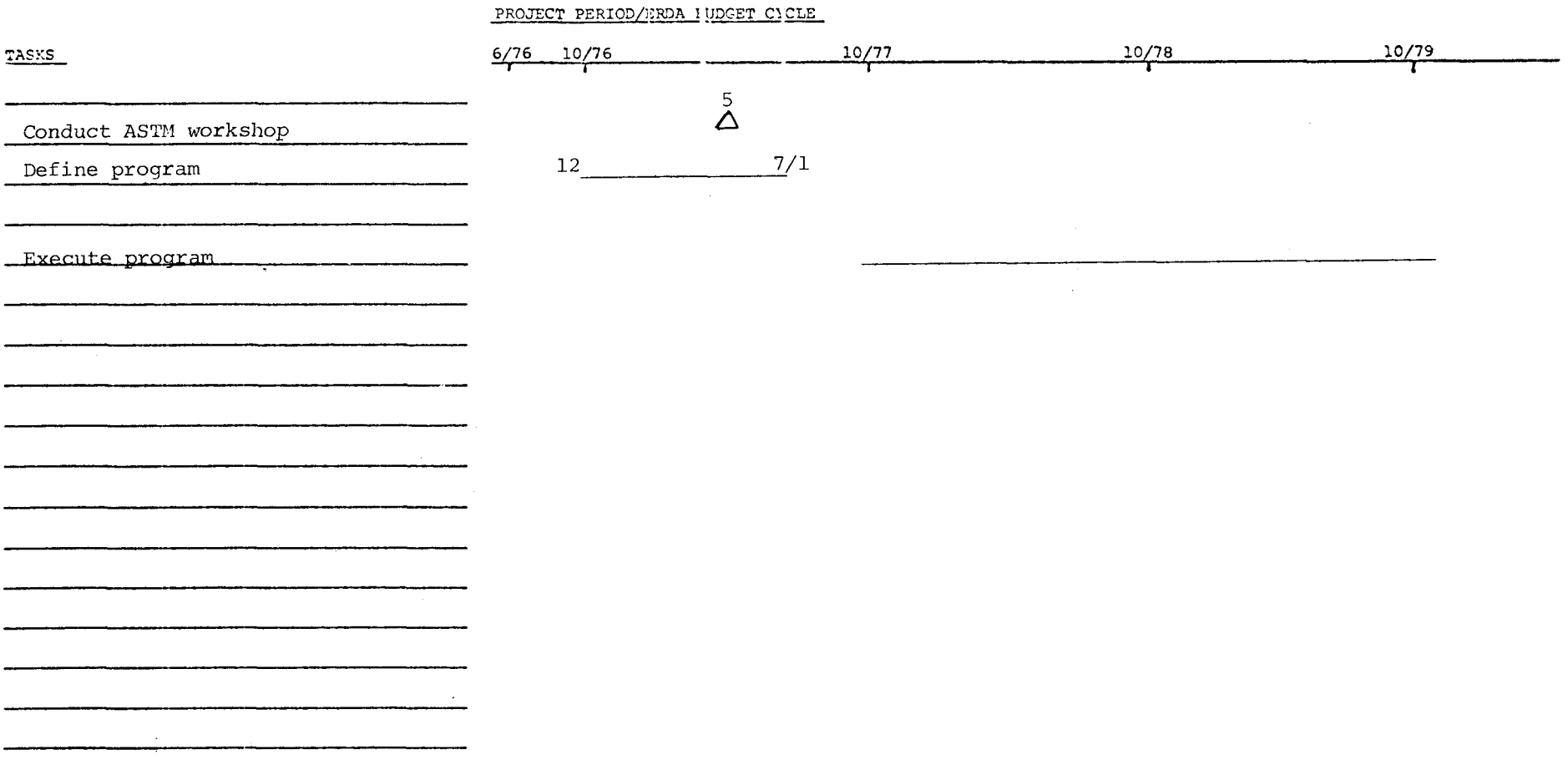
CONTRIBUTION FROM OTHER PARTICIPANTS IN THE PROJECT:

OBJECTIVES FOR 1977:

NOTES:

Date 9/76

SCHEDULE OF SIGNIFICANT ERDA TASKS TO BE PERFORMED UNDER PROJECT, AND PROJECTION OF COSTS TO BE INCURRED



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