

MEMORANDUM OF UNDERSTANDING
BETWEEN THE GOVERNMENT OF THE UNITED STATES AND THE
GOVERNMENT OF THE ITALIAN REPUBLIC CONCERNING
ENERGY COOPERATION

The Government of the United States and the Government of the Italian Republic, acting through the United States Department of Energy (DOE) and the Italian Ministry of Industry, Commerce and Handicraft (MOI), respectively;

Believing that energy cooperation is an important and mutually beneficial aspect of their respective energy policies to reduce dependence on imported oil;

Considering the understandings already reached within the United States-Italy Energy Working Group;

Taking into account the exchange of views and the contacts at the technical level aimed at the definition of the areas of common interest in the various energy sectors;

Desiring to complement and reinforce energy research and development activities in their respective countries, as well as their participation in the research and development activities of the International Energy Agency, agree as follows:

1. Subject to the provisions of Annex I, the parties will cooperate in the fields of coal, solar and electric energy research and development and information exchange as well as other fields which the parties may add by mutual agreement in writing.

2. The areas of cooperation contemplated by this Memorandum of Understanding may include those specific projects more fully described in Annex II (Coal), Annex III (Solar), and Annex IV (Electricity), as well as any other project which the parties may add by mutual agreement in writing.

3. In order to review and approve projects and to exercise management overview of activities under this Memorandum of Understanding, there shall be established a Joint Working Group.

Each party shall appoint two representatives to the Joint Working Group and such technical or other advisors as it deems appropriate.

The Joint Working Group may establish such subgroups as it deems appropriate. The Joint Working Group, or subgroup thereof, shall meet to review progress and to discuss, as required, issues arising from the implementation of specific projects.

The Joint Working Group may also consider the feasibility of undertaking additional projects or programs in these or other fields, as appropriate.

4. All costs resulting from cooperation under this Memorandum of Understanding will in principle be shared by the parties equally, except when otherwise specifically agreed in writing or when it is determined by the parties that the preponderance of construction activities or hardware development is in one of the two countries. In such cases, it is understood that both parties through the Joint Working

Group may have to define and agree further on specific cost sharing in connection with such a project before the particular project is undertaken. It is further understood that the ability of the parties to carry out their obligations is subject to the availability of appropriated funds.

5. The provisions contained herein shall not affect the rights or duties of the parties under other agreements or arrangements.

6. This Memorandum of Understanding shall enter into force upon signature; shall remain in force for a period of five (5) years; may be extended by mutual agreement in writing; and may be terminated in whole or with respect to any area of cooperation under this Memorandum of Understanding at any time in the discretion of either party upon sixty (60) days advance notification in writing. This Memorandum of Understanding may be amended only by mutual agreement in writing.

DONE at ROME this 17th day of October,
1979, in duplicate in the English and Italian languages,
both texts being equally authentic.

FOR THE GOVERNMENT OF
THE UNITED STATES OF
AMERICA

Ruben A. Anderson

FOR THE GOVERNMENT OF THE
ITALIAN REPUBLIC

Leon B. Riegler

Annex I

Article 1

Cooperation in accordance with this Memorandum of Understanding may include but is not limited to the following forms:

1. Exchange of scientists, engineers and other specialists. Such exchanges of staff shall be in accordance with Article 7 of this Annex I.
2. Joint research and development in the form of experiments, tests and other technical collaborative activities.
3. Exchange of samples, materials, instruments and components for testing. Such an exchange is to be implemented subject to a separate memorandum executed by both parties.
4. Exchange, on a current basis, of scientific and technical information, and results and methods of research and development.
5. The organization of seminars and other meetings on specific agreed topics concerning solar, coal or electricity technologies in a manner agreed upon by the Joint Working Group.
6. Visits by specialist teams or individuals to the electricity transmission, solar and coal research facilities of the other party.
7. Exchange of scientists, engineers and other specialists for participation in agreed research, development, analysis, design and experimental activities conducted in scientific centers, laboratories, engineering offices and industrial facilities of each of the parties or its contractors for agreed periods. Such exchange shall be in accordance with Article 7 of this Annex I.

Article 2

If it is decided that a cooperative program or project under this Memorandum of Understanding should be subject to a specific memorandum executed by both parties, the specific memorandum should cover all detailed provisions for implementing that program or project, including such matters as patents, exchange of equipment and information disclosure specific to the particular program or project.

Article 3

Cooperation under this Memorandum of Understanding shall be in accordance with laws of the respective countries and the regulations of the respective Parties. All questions related to the Memorandum of Understanding arising during its term shall be settled by the Parties by mutual agreement.

Article 4

1. General

The Parties support the widest possible dissemination of information provided or exchanged under this Memorandum of Understanding, subject to the need to protect proprietary information exchanged hereunder, and to the provisions of Article 6.

2. Use of Proprietary Information

A. Definitions as used in this Memorandum of Understanding:

- (i) The term "information" means scientific or technical data, results or methods of research and development, and any other information intended to be provided or exchanged under this Memorandum of Understanding.
- (ii) The term "proprietary information" means information which contains trade secrets or commercial or financial information which is privileged or confidential, and may only include such information which:
 - a) has been held in confidence by its owner;
 - b) is of a type which is customarily held in confidence by its owner;
 - c) not generally known or publicly available from other sources;
 - d) has not been transmitted by the transmitting Party to other entities (including the receiving Party) except on the basis that it be held in confidence; and
 - e) is not otherwise available to the receiving Party from another source without restriction on its further dissemination.

B. Procedures

- (i) A Party receiving proprietary information pursuant to this Memorandum of Understanding shall respect the privileged nature thereof. Any document which contains proprietary information shall be clearly marked with the following (or substantially similar) restrictive legend:

"This document contains proprietary information furnished in confidence under a Memorandum of Understanding dated _____ between the United States Department of Energy and the Ministry of Industry, Commerce and Handicraft of the Government of the Italian Republic, and shall not be disseminated outside these organizations, their contractors, licensees and the concerned governmental departments and agencies without the prior approval of

This notice shall be marked on any reproduction hereof, in whole or in part. These limitations shall automatically terminate when this information is disclosed by the owner without restriction."

- (ii) Proprietary information received in confidence under this Memorandum of Understanding may be disseminated by the receiving Party to:
 - a) persons within or employed by the receiving Party, and other concerned Government departments and Government agencies in the country of the receiving Party;
 - b) prime or subcontractors of the receiving Party located within geographical limits of the receiving Party's nation, for use only within the framework of their contracts with the receiving Party in work relating to the subject matter of the proprietary information;

provided that, any proprietary information so disseminated shall be pursuant to an agreement of confidentiality and shall be marked with a restrictive legend substantially identical to that appearing in subparagraph 2.B(i) above.

- (iii) With the prior written consent of the Party providing proprietary information under this Memorandum of Understanding, the receiving Party may disseminate such proprietary information more widely than otherwise permitted in the foregoing subsection (ii). The Parties shall cooperate with each other in developing procedures for requesting and obtaining prior written consent for such wider dissemination, and each Party will grant such approval to the extent permitted by its national policies, regulations and laws.

- C. Each party shall exercise its best efforts to ensure that proprietary information received by it under this Memorandum of Understanding is controlled as provided herein. If one of the Parties becomes aware that it will be, or may reasonably be expected to become, unable to meet the nondissemination provisions of this Article, it shall immediately inform the other Party. The Parties shall thereafter consult to define an appropriate course of action.
- D. Information arising from seminars and other meetings arranged under this Memorandum of Understanding and information arising from the attachments of staff, use of facilities and joint projects shall be treated by the Parties according to the principles specified in this Article; provided, however, no proprietary information orally communicated shall be subject to the limited disclosure requirements of this Memorandum of Understanding unless the individual communicating such information places the recipient on notice as to the proprietary character of the information communicated.
- E. Nothing contained in this Memorandum of Understanding shall preclude the use or dissemination of information received by a Party through arrangements other than those provided for under this Memorandum of Understanding.

Article 5

The application or use of any information exchanged or transferred by the Parties under this Memorandum of Understanding shall be the responsibility of the Party receiving such information, and the transmitting party does not warrant the suitability of the information transmitted for any particular use or application by the Receiving Party or by any third Party. Neither Party warrants the accuracy of jointly developed information or its suitability for any particular use or application by either Party or by any third Party.

Article 6

- 1. With respect to any invention or discovery made or conceived in the course of or under this Memorandum of Understanding:
 - A. If made or conceived by personnel of one Party (the Assigning Party) or its contractors while assigned to the other party (the Receiving Party) or its contractors in connection with exchanges of scientists, engineers and other specialists:

- (i) The Receiving Party shall acquire all right, title and interest in and to any such invention or discovery in its own country and in third countries, subject to a non-exclusive irrevocable, royalty-free license in all such countries in the Assigning Party with the right to grant sublicenses, under any such invention or discovery and any patent application, patent or other protection relating thereto.
 - (ii) The Assigning Party shall acquire all right, title and interest in and to any such invention or discovery in its own country, subject to a non-exclusive, irrevocable, royalty-free license to the Receiving Party with the right to grant sublicenses, under any such invention or discovery and any patent application, patent or other protection relating thereto.
 - B. If made or conceived by a Party or its contractors as a direct result of employing information which has been communicated to it under this Memorandum of Understanding by the other Party or its contractors or communicated during seminars or other joint meetings the Party making the invention shall acquire all right, title and interest in and to such invention or discovery in all countries.
 - C. With regard to other specific forms of cooperation, including loans or exchanges of materials, instruments and equipment for special joint research projects, the Parties shall provide for appropriate distribution of rights to inventions or discoveries resulting from such cooperation. In general, however, each Party should normally own the rights to such inventions or discoveries made in its own country with a non-exclusive, irrevocable, royalty-free license to the other Party. The rights to such inventions or discoveries in other countries should be agreed by the Parties on an equitable basis.
- 2. Neither Party shall discriminate against citizens of the country of the other Party with respect to granting any license or sublicense under any invention or discovery pursuant to paragraph 1 above.
 - 3. Each Party shall assume the responsibility to pay awards or compensation required to be paid to its own nationals according to its own laws.

Article 7

1. Whenever an exchange of staff is contemplated under this Memorandum of Understanding, each Party shall ensure that qualified staff are selected for attachment to the other Party.
2. Each such attachment of staff shall be the subject of a separate attachment agreement between the Parties.
3. Each Party shall be responsible for the salaries, insurance and allowances to be paid to its staff.
4. Each Party shall pay for the travel and living expenses of its staff while on attachment to the host Party unless otherwise agreed.
5. The host establishment shall arrange for comparable accommodations for the other Party's staff and their families on a mutually agreeable reciprocal basis.
6. Each Party shall provide all necessary assistance to the attached staff (and their families) of the other Party as regards administrative formalities (travel arrangements, etc.).
7. The staff of each Party shall conform to the general and special rules of work and safety regulations in force at the host establishment, or as agreed in separate attachment of staff agreements.

Article 8

Both Parties agree that in the event equipment is to be exchanged or supplied by one Party to the other, the following provisions shall apply covering the shipment and use of agreed equipment.

1. The sending Party shall supply as soon as possible a detailed list of the equipment to be provided together with the relevant specifications and technical and other documentation.
2. The equipment and necessary spare parts supplied by the sending Party for use in joint projects shall remain its property and shall be returned to the sending Party upon completion of the mutually agreed upon activity unless otherwise agreed.
3. The above-mentioned equipment shall be brought into operation at the host establishment only by mutual agreement between the Parties or between their senior representatives at the host establishment.
4. The host establishment shall provide the necessary premises for the equipment, and will provide for electric power, water, gas, etc., in accordance with technical requirements which shall be as mutually agreed.

5. Responsibility and expenses for the transport of equipment and materials from the United States by plane or ship to an authorized port of entry in Italy convenient to the ultimate destination, and return, and also responsibility for their safekeeping and insurance en route, shall rest with DOE or an entity designated by DOE, provided that such entity is approved in advance in writing by the MOI.
6. Responsibility and expenses for the transport of equipment and materials from Italy by plane or ship to an authorized port of entry in the United States convenient to the ultimate destination, and return, and also responsibility for their safekeeping and insurance en route, shall rest with the MOI or an entity designated by the MOI, provided that such entity is approved in advance in writing by DOE.
7. The equipment provided by the sending Party for carrying out mutually agreed upon activities shall be considered to be scientific, not having a commercial character.
8. The receiving Party shall be responsible for safekeeping and insurance en route from authorized port of entry to the ultimate destination and return.

Article 9

Compensation for damages incurred during the implementation of this Agreement will be in accordance with the applicable laws of the Parties.

Annex II

Joint Coal Program

| <u>Title</u> | <u>Project</u> |
|---|----------------|
| Utilization of Sulcis Coal | A |
| Testing of SRC-I (Solvent Refined Coal) for Metallurgical Purposes | B |
| Ash Disposal | C |
| Operational Procedures for Electric Powerplants | D |
| Fluidized Bed Combustion | E |
| Development of Coal Transshipment Terminal at Gioia Tauro | F |

Note: All programs and all "Proposed Budget" figures are subject to budgetary approval by DOE, U.S. Government and U.S. Congress. All figures are maximum and subject to change.

Annex II

Italy/U.S. Joint Coal Program

Project A

Utilization of Sulcis Coal

Aim: Technical and Economic Analysis of Sulcis coal for development of a coal utilization facility in Sardinia.

Method: Send samples of Sulcis coal to the U.S. for testing in Morgantown, West Virginia, DOE/METC (Morgantown Energy Technology Center). Coal to be analyzed for fluidized bed combustion, coal gasification, or other process, as available. Technical staff from Italy to be at DOE/METC and assist in testing and analysis. Analysis will utilize U.S. procedures and methods but Italian experts will derive independent conclusions.

DOE Role: Provide technical supervision and assistance at DOE labs to analyze Sulcis coal samples.

MOI Role: Send coal samples and provide technical staff for analysis in U.S. (amount of coal required will be defined for specific tests and analysis).

Schedule: Training of Italian technical staff at DOE lab at Morgantown, West Virginia, and other locations to coincide with lab analysis of Sulcis coal.

Funding: Sending party assumes expenses of technical staff, and transportation costs of coal samples.

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DOE Role: Provide technical supervision and assistance at DOE labs to analyze Sulcis coal samples.

MOI Role: Send coal samples and provide technical staff for analysis in U.S. (amount of coal required will be defined for specific tests and analysis).

Schedule: Training of Italian technical staff at DOE lab at Morgantown, West Virginia, and other locations to coincide with lab analysis of Sulcis coal.

Funding: Sending party assumes expenses of technical staff, and transportation costs of coal samples.

Project B

Testing of SRC-I (Solvent Refined Coal) for Metallurgical Purposes

Aim: To send samples of SRC coal to Italsider's Genoa labs for testing.

Method: DOE will send SRC samples to Cornigliano, Genoa lab for testing by Italsider. Two technical experts from Italsider will visit DOE SRC-I lab in Tacoma, Washington, or Riversville, West Virginia, for two to three weeks research and analysis work. Technical results of lab analysis will be made available to DOE.

DOE Role: Prepare and package SRC coal samples for shipment to Genoa.

MOI Role: Test coal in Cornigliano, Italy, for use in metallurgical applications and send technical experts to SRC labs in the United States.

Schedule: SRC samples will be available at Tacoma, Washington in the near future, for shipment to Italy.

Funding: The cost of processing the SRC coal at the DOE laboratory, special handling and packaging are to be assumed by DOE. Arrangements for transportation of the SRC-I coal samples to Cornigliano, Genoa, Italy are to be assured by Italsider.

Project C

Ash Disposal

Aim: Technical information exchange on ash disposal from coal-fired powerplants.

Method: Two ENEL technicians will visit U.S. coal-fired electric powerplants for discussions on current U.S. practice on ash disposal. Exchange visit to Italy by U.S. experts will follow.

DOE Role: Arrange visits of ENEL technicians to electric powerplants in U.S. and visit of U.S. experts to Italian electric powerplants.

NOI Role: Arrange ENEL technical staff to visit U.S. facilities and arrange reciprocal visit by U.S. experts to Italy.

Schedule: A three to four week visit of Italian technical staff to U.S. facilities will take place in the near future. DOE will assist in itinerary and reciprocal visit.

Funding: Sending Party will assume costs of visit by its experts.

Project D

Operational Procedures for Electric Powerplants

Aim: Technical information exchange on current--
U.S. coal-fired electric powerplant operations.

Method: Groups of three technical experts from ENEL
will visit U.S. electrical utilities to
review current operating practice. Visits to
U.S. coal-fired electric boiler manufacturers
will be scheduled for review of equipment.

DOE Role: Arrange visits to electric powerplants and
equipment manufacturers. DOE will assist in
arranging itinerary and reciprocal visit.

MOI Role: Technical staff will visit U.S. facilities.

Schedule: One visit of Italian technical staff (two or
three weeks) to appropriate U.S. coal-fired
boiler manufacturers. Arrangements will be
made by DOE. Three (or more) visits of
Italian technical staff to U.S. coal-fired
electric power facilities (each of three
weeks duration).

Funding: Sending Party will assume costs of visit by
its experts.

Project E

Fluidized Bed Combustion

Aim: To assist Italian research laboratories in development of Fluidized Bed Combustion technology.

Method: Technical exchange and assistance from DOE and Massachusetts Institute of Technology. One ENEL (Ente Nazionale per l'Energia Elettrica), one CESEN (Centro Studi Energia), one ENI (Ente Nazionale Idrocarburi), and one Italian academic expert will visit U.S. laboratories.

DOE Role: Arrange visits and return visits by U.S. experts to Italy.

MOI Role: Send technical experts to U.S. and arrange for visit of U.S. experts to Italy.

Schedule: Arrangements will be made by DOE for a visit by Italian experts.

Funding: Sending Party will assume cost of visit by its experts.

Project F

Development of a Coal Transshipment Terminal at Gioia Tauro

Aim: Information exchange on current practice for design and utilization of a coal storage and transshipment terminal.

Method: Technical exchange of information concerning port procedures. Italian and U.S. experts will visit U.S. coal ports, review current problems, and exchange methodology.

DOE Role: Contact coal transport and port experts for presentation at DOE; arrange visits by Italian technical experts to U.S. coal export facilities.

Schedule: Arrange visit by Italian port technical experts to U.S. coal port facilities in the near future (visit duration three weeks). Presentation by U.S. port facilities experts in Washington, D.C. and reciprocal visit to Gioia Tauro.

Funding: Sending Party will assume cost of visit by its experts.

Annex III

Italy/U.S. Joint Solar Energy Program

Project A

Title: 40-kWe Parallel Solar Thermal and Photovoltaic System Field Experiments

Duration: 3 years

Proposed
Budget: Year 1 - \$200,000; Year 2 - \$2,100,000;
Year 3 - \$200,000; Total - \$2,500,000

The objectives to be met on this project are to design and optimize two small power systems based upon solar thermal and photovoltaic technology for use in rural, off-grid applications in Italy and to assess the ability of each technology to meet the energy needs of a selected community. Each system is to be operated under field conditions to measure and evaluate system performance and to evaluate solar hardware components.

Two solar energy technologies will be considered in this project--a solar thermal electric conversion system using parabolic troughs, and a photovoltaic conversion system--each delivering nominally 20 kilowatts peak electrical output. The systems may be installed in the same general region selected from among several remote, rural communities in southern Italy or Sicily not presently connected to the electric grid. Both systems will employ concentrating optics. End use applications could include water pumping, lighting and refrigeration. Consideration for siting the two systems would include the benefits of location in the same village or in two nearby villages in the same general vicinity. Comparisons of cost, performance, reliability and other factors will be made between the different systems, taking into account any significant differences in conditions in which they operate.

Five phases are planned: (1) site selection and data collection (by ENEL); (2) conceptual design and procurement materials preparation; (3) procurement and contract award; (4) contractor design, construction, installation, and checkout; and (5) operation, maintenance, and data collection/analysis. (This last phase may be extended for three more years if determined to be of mutual benefit.) Following phase (2), a decision will be made as to the most cost-effective approach for fielding these technologies at the site(s) chosen.

Annex III

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Project B

Title: Testing and Characterization of Components
 Devices, and Materials

Duration: 2 years

Proposed
Budget: Year 1 - \$100,000; Year 2 - \$150,000;
 Total - \$250,000

The objective of the project is to improve the state of the art in solar thermal and photovoltaic technology development.

Solar energy conversion components, subsystems, devices, and materials that are being developed or commercially available in both countries will be exchanged and evaluated by counterpart facilities in solar thermal and photovoltaic technologies. Common methodologies of test procedure and performance evaluation will be adopted by both countries.

Project C

Title: Utility Applications of Solar Central
Receiver Technology

Duration: 1 year

Proposed
Budget: \$315,000

The feasibility and impact of interfacing large solar central receiver power plants into a large electric grid will be examined, having as reference the Italian grid. Several studies will be performed, with special attention devoted to economic studies of capital cost and costs of producing electrical energy, future cost reduction potential with improved technologies and large scale production, and to the assessment of the R and D effort still required.

Project D

Title: Small Photovoltaic System Field Experiment

Duration: 3 years

Proposed
Budget: Year 1 - \$250,000; Year 2 - \$40,000;
Year 3 - \$40,000; Total - \$330,000

A photovoltaic system delivering 3 to 5 kilowatts peak electrical output, and using flat-plate arrays, will be installed at a remote, rural site in southern Italy or Sicily not presently connected to the electric grid, to meet consumer electrical needs. The cost-effectiveness of the system will be determined, and its performance compared with a similar system presently installed in a village in Schuchuli, Arizona.

Four phases are planned: (1) site selection by ENEL and system design; (2) procurement and contract award; (3) contracted design, construction, installation and checkout; and (4) operation, maintenance, and data collection/analysis. (This last phase may be extended for three more years if determined to be of mutual benefit.)

Project E

Title: Research and Development Exchange in
 Photovoltaics

Duration: 3 years

Proposed

Budget: Year 1 - \$25,000; Year 2 - \$35,000;
 Year 3 - \$35,000; Total - \$95,000

A scientific meeting will take place for experts in the field of photovoltaic conversion of solar energy to exchange information and to define areas of strong mutual interest. Following the meeting, interchanges of ideas and personnel will facilitate the performance of any collaborative research studies selected at the meeting. In particular, selected Italian scientists will spend appropriate periods of time at SERI (Solar Energy Research Institute) to collaborate with their colleagues there.

Project F

Title: Design and Testing of Passive Solar Systems
and Components

Duration: 3 years

Proposed

Budget: Year 1 - \$150,000; Year 2 - \$250,000;
 Year 3 - \$100,000; Total - \$500,000

The objectives of the project are to pool the design and testing experience of both countries in passive solar technology, and to provide a systematic comparison of the performance of passive solar components within the different climates, contexts, and building types, with common testing methodology.

A number of multi-family or commercial buildings which will include a number of passive solar systems and components will be jointly designed, instrumented, and tested. These passive solar systems will be compared within the different climates, contexts, and building types, and a design manual will be compiled. In addition, the results of the joint experience in overcoming institutional barriers to passive solar implementation will be disseminated.

Five phases are planned, each concluding with a joint technical meeting: (1) project development; (2) conceptual design; (3) detailed design; (4) construction and instrumentation; and (5) data collection/analysis. Phase (5) may be extended if determined to be of mutual benefit.

Project G

Title: Solar Energy Information Exchange
Duration: 3 years
Proposed
Budget: Year 1 - \$30,000; Year 2 - \$50,000;
 Year 3 - \$50,000; Total - \$130,000

A joint project for solar energy information exchange, which has not yet been discussed in detail by the two countries is contemplated.

In order to effect this project, the DOE Office of Technical Information (OTI) may play a major role in actual exchange of materials, while the Solar Energy Research Institute (SERI) will take on the overall U.S. lead responsibility for the project. Where information is available publicly, each country will avail itself of such sources. Documents made available by Italy in the Italian language will be accompanied by an English language abstract, except on occasions when a full English translation has been requested.

SERI will facilitate Italian acquisition of U.S. information materials, and will also supply SERI reports, a library catalog, and a solar energy bibliography. (Certain documents and bibliographic computer tapes may be supplied directly by OTI.) SERI will serve as a liaison to link U.S. and Italian research personnel and institutions, and to provide consultation to visiting Italians who wish to discuss information-related matters.

The Italian lead organization will actively seek out, assemble, and provide English language abstracts of a wide range of solar energy information. It will supply SERI with bibliographic data; details of conferences and exhibitions; directories; detailed industry and product information; data on research development, and installations of components and systems in each solar energy technology; and public information on legislation, patents, and international agreements.

In order to ensure data-base compatibility and to facilitate data exchange, the two countries will be in close consultation as solar energy data-bases become available. Furthermore, the designated coordinators of information exchange in each country will meet as required to discuss the solution of any problems and to exploit further opportunities for such exchange of information. (This project may be extended for an additional period if determined to be of mutual benefit.)

Annex IV
Joint UHV Program

| <u>Title</u> | <u>Project</u> |
|--|----------------|
| Electric Field Effects From High Voltage Transmission Lines | A |
| Conductor Support Systems and Increased Power Density | B |
| 1200 kV Prototype Equipment and Line Design | C |
| Electrical Load Modelling for Use in Planning and Analyzing of Large Power Systems Containing UHV Transmission Lines | D |

Note: All programs and all "Proposed Budget" figures are subject to budgetary approval by DOE, U.S. Government and U.S. Congress. All figures are maximum amounts and subject to change.

Annex IV

Italy/U.S. Joint UHV Program (Electricity)

Each specific project under this program will be coordinated by a technical subgroup of the Joint Working Group, in which the Italian side will be represented by ENEL.

Project A

Electric Field Effects from High Voltage Transmission Lines

Aim:

There are a number of environmental effects from high voltage transmission lines, several of which have long been recognized, characterized and standardized by the electric power industry, e.g., radio and television interference. Concerns about other, more subtle, effects have arisen in recent years and are the subject of many scientific experiments in the U.S. and in Italy as well as in other countries. Foremost among these concerns is the possibility that physiological and psychological changes could occur in humans and animals when exposed to high voltage electric fields such as those under high voltage lines. There is no positive evidence that such effects exist at the present level of electric fields. However, it is essential that it be determined if there are effects and at what electric field levels they occur.

Method:

Specific areas of technical cooperation to foster the overall aim of the exchange are:

- ° Measurements and diagnostics of electric field effects.
- ° Basic biological studies.
- ° Human related biological studies.
- ° Annoyance factors (e.g., spark discharges, audible noise).
- ° Ecological effects.

DOE Role: Coordinate exchange of technical data generated under various research contracts and other Federal investigations on electric field effects. Periodic visits of DOE and contractor research scientists for joint experiments are anticipated.

MOI and ENEL Role: Supply data from similar programs in electric field effects conducted in Italy by ENEL or its contractors. Scientific visits of Italian researchers for joint laboratory experiments to confirm results are anticipated.

Schedule: Duration is anticipated to be three to five years, depending upon experimental results. Visiting scientists would participate in joint experiments at a minimum of one per year. Management reviews by the technical subgroup would take place once annually with the meeting location alternating between the U.S. and Italy.

Project B

Conductor Support Systems and Increased Power Density

- Aim: Changing social and institutional attitudes over the last two decades have increased the difficulty in obtaining corridors for transmission lines. This is unlikely to lessen and indeed could become worse, and coupled with lines reserve margins, could result in severe economic disruptions as electric power service becomes less reliable and subject to prolonged blackouts. New technologies which increase power density over given corridors, and which do not have greater impact on the environment than at present could make this problem more manageable. Furthermore, new concepts in structures or line designs can reduce land requirements and possibly allow higher voltage transmission to be employed with no greater total effect on the environment.
- Methods: Specific areas of technical information exchange would include:
- ° New conductor designs.
 - ° New transmission concepts to increase power density, such as higher phase order.
 - ° Composite structures combining structural and insulating members.
 - ° Mechanical and electrical specifications for advanced transmission concepts.
 - ° Visual and aesthetic assessments.
- DOE Role: Provide forum for timely exchange of technical results obtained from DOE research programs. Coordinate jointly sponsored experimental projects for mutual benefit of both countries.

MOI and ENEL Role: Provide technical information and test data on experiments related to conductor support systems and increased power density transfer.

Schedule: Two to three years with possible extension if mechanical testing is included. The technical subgroup will meet at least once annually to coordinate project plans with the location of the meeting to alternate between the U.S. and Italy. Engineering exchange visits for purposes of joint experiments will be scheduled as needed; one visit per year seems appropriate at this time.

Funding: Sending Party will assume costs of visits by its experts.

Project C

1200kV Prototype Equipment and Line Design

Information relating to this project developed prior to or outside the scope of this project which is proprietary, as defined in Article 4.2.A.(ii) of Annex I may be disseminated by the Receiving Party to other possible third parties only under special agreements to be further negotiated and concluded between the Parties to this Memorandum of Understanding.

Aim:

Making the "next step" in the U.S. from 765kV to 1100-1200kV will not be a mere extension of the technology. There will be a strong requirement for significant apparatus research and extensive testing of prototype designs. The Italian Suvereto project is capable of significantly complementing the testing capability of the U.S. facilities in addition to having a long 1100kV line actually carrying load from a nearby steam plant. By complete and timely exchange of test results from these facilities, the emerging 1200kV technology can be more rapidly developed for general application.

Methods:

Specific areas of technical exchange to be included are:

- ° Measurements under all test combinations, of line design variables, such as audible noise, RI, TVI, electric fields, perception of field, etc.
- ° Conductor design results.
- ° Insulation contamination withstand.
- ° Insulation coordination for steep front and slow front waves applicable.
- ° Substation prototype equipment (such as circuit breakers, transformers, lightning arresters, etc.).
- ° Mechanical rest results for various support systems employed.

Project D

Electrical Load Modeling for Use in Planning and Analyzing
of Large Power Systems Containing UHV Transmission Lines

Aim:

The analysis which precedes the adoption by an electric utility of a UHV transmission system considers both the maturity and social acceptability of the technology and the interaction of this transmission system with the present complex of generating plants and transmission lines. Electric utilities have developed a number of methods and supporting data records to perform such analysis. A very important part of these analysis procedures is the treatment given to the behavior of the electrical load; this is, unfortunately, also the weakest part of the analysis. This weakness has been widely recognized and presently DOE, EPRI and ENEL have active research projects in load modeling. As these projects tend to require long periods to produce results and are quite expensive, the ability to interact with the personnel associated with the ENEL load modeling projects will produce savings in time and money for both parties.

Methods:

Specific areas of technical information exchange would include:

- ° Mathematical analysis of various load modeling concepts under development.
- ° Algorithms for constructing load models.
- ° Data on load behavior.
- ° Sampling strategies for obtaining load data.
- ° Computer programs for analyzing load data.

DOE Role:

Provide for full participation by ENEL in the ongoing Electric Energy Systems Division (EES) Systems Engineering subprogram on Load Modeling. Such participation may involve:

- Exchange of all interim reports among contractors.
- Participation in mid-project and final Engineering Foundation workshops where interim results and final reports are reviewed and criticized in depth.

MOI and ENEL Role: Equivalent provision by ENEL for EES participation in continuing review of ongoing load modeling research by ENEL.

Schedule: To start in the near future and continue through September 30, 1982.

Funding: Sending Party will assume costs of visits by its experts.