FINAL REPORT

Djibouti Energy Initiatives Project
Contract No. PCD-1406-I-00-2174-01

Submitted to:

United States Agency for International Development

by

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DJIBOUTI ENERGY INITIATIVES PROJECT

I. SUMMARY

The Djibouti Energy Initiatives Project, designed in 1981, has been under way in the field since October, 1982. This report is the result of a "mid-term" evaluation performed in December, 1984 by a three-member team consisting of a renewable-energy specialist, an energy-conservation specialist, and an energy economist/planner.

The evaluation team concluded that the Energy Initiatives Project in Djibouti has been successful from a number of points of view. It has had a beneficial effect on Djibouti by setting the stage for a program of conservation and energy-efficiency improvement that could result in annual foreign-exchange savings of millions of dollars over the next decade. Operating under difficult conditions in a newly independent country, the Contractor, Volunteers in Technical Assistance (VITA), has fulfilled or exceeded virtually all of its responsibilities in spite of contradictory signals built into the Project Paper and the French and English versions of the Project Agreement.

To date, the Project has succeeded in:

- Assisting the development of the Institut Superieur d'Etudes et de Recherches Scientifiques et Techniques (ISERST) to the extent that it is now recognized as the leading organization in Djibouti in the fields of energy research and conservation

- Gaining the attention and interest of donors, officials of the Government of the Republic of Djibouti (GROD), and private-sector individuals concerning energy supply and conservation

- Providing AID, other donors, the GROD, and private Djiboutians with a good picture of energy supply and end-use patterns and suggested actions/interventions to address the country's energy problems through a National Energy Assessment and a variety of special consultancies

The Project has suffered from a lack of coherent guidance from AID and from conflicting signals/directions (contained in the PP itself, and followed by subsequent changes in priorities) on Project objectives. Overemphasis on the construction and completion of the ISERST building has distracted the Contractor from other activities called for in the PP, Contract, and subsequent amendments. While the Contractor has engaged in numerous positive interventions, little comprehensive follow up in areas that show promise (e.g., energy conservation in the residential and commercial sectors, energy-efficient prototype housing, construction, testing and dissemination) has been possible so long as the ISERST building problems have continued to be outstanding and the Contractor's Scope of Work remains unmodified.

Although the PP placed great emphasis on the role of renewable-energy technologies in the Energy Initiatives Project, with provision for several

prototype/interventions, both USAID and the Contractor recognized the limitation on the role of such interventions in Djibouti, once Project implementation was begun in the field, and those projects that were not appropriate were removed from the Work Plan. Nevertheless, within the restrictions of the amended Work Plan, the Contractor's Chief of Party (COP) has succeeded in putting several windmill pumpers back in operation and in initiating a collaborative arrangement with two local agencies to maintain these water supplies in water-short Djibouti.

VITA's achievements in conservation have mostly been in line with the Project Paper expectations, taking into consideration AID's priorities, for the first two years of the Project, on the completion of the new ISERST building and on data-base activities. A particularly successful activity has been the consultancy of energy-auditing expert Seymour Jarmul. The training activities, the audits, the closing seminar, and the publication of his report ("Reducing Energy Consumption in Buildings") were rated very highly by all persons interviewed during the evaluation. The COP and his consultants have been successful in raising the awareness of his counterpart ("homologue chef de projet") and of the ISERST director to the importance of energy-conservation activities. There is much still to be done, however, to build up a similar awareness in the responsible ministries.

This evaluation recommends several actions all aimed at redirecting the Project toward an increased emphasis on energy-conservation activities, which all parties concerned -- USAID, VITA, the ISERST Director, and the evaluation team -- agree will have the most significant beneficial impact on Djibouti's energy-import bill. The evaluation team feels strongly that the success of this redirection depends 1) on relieving the Contractor from distracting burdens associated with the construction of the new ISERST building, and 2) in view of the time lag involved in the various aspects of conservation projects (education, demonstrations, auditing, evaluation, construction), on extending the Project Activity Completion Date for one year. This extension, and the additional activities recommended, could be financed from the funds remaining in the Project budget that have not been included in the Contract. (See SUMMARY OF RECOMMENDATIONS.)

In summary, while maintaining some aspects of its work in renewable energy, the Project should now focus on information and awareness programs in energy conservation, carefully selected demonstrations of energy-saving practices and techniques, and associated training, with staffing patterns planned accordingly. If these recommendations are followed, the Energy Initiatives Project will have made a significant beneficial impact on Djibouti's national economy by the final PACD.

II. INTRODUCTION

A. DESCRIPTION OF THE PROJECT

1. Summary of Project Paper

The Djibouti Energy Initiatives Project was designed and approved in 1981 with two basic purposes:

- Assisting the Government of the Republic of Djibouti (GROD) "to reduce its balance of payments disequilibria caused by the importation of fossil fuels by introducing a solar and wind energy and energy conservation capability;" and

- Endeavoring "to strengthen the critical link between economic development planning and requisite applied research and studies by strengthening Djibouti's single scientific and technological research institute." (PP,I/1)

The Project Paper (PP) proposes to accomplish this double purpose by:

- Undertaking "the immediate groundwork required for an eventual national onservation effort and a national energy sector strategy;" and

- Developing "a capacity for development and evaluation of those alternate energy technologies which have not yet been considered in Djibouti's energy strategy." (PP,I/1)

Further, the approach was to be effected by the following strategy, proposed in the project design, aimed at overcoming the lack of an information base, the lack of trained personnel in these areas, and the lack of physical facilities: (PP,II/5)

- Establish a data base and an analytical capability for current and future general energy use nationwide;

- Establish a data base and an analytical capability for evaluating technical and economic feasibility of specific alternative energy technologies;

- Provide necessary training within ISERST to accomplish the goals above;

- Design, assemble, and test prototype solar and wind equipment in collaboration with potential users and develop prototype renewable-energy models for promising sectors;

- Provide necessary equipment;

- Train local staff in all aspects of prototype activity;

- Use information gained from these activities "to provide input into GROD energy policy options in the areas of production and conservation;"

- Establish information-dissemination center within ISERST; and

- Establish within ISERST a capacity to evaluate the prototypes tested in terms of conservation and program goals.

As far as conservation is concerned, the PP called for a series of activities aimed at saving energy in space cooling and other end uses, and industrial and rural development processes. More specifically, the anticipated outputs were "research, consultancy, training and professional diffusion of technical studies and on-site demonstration processes on how to save energy" in the activities mentioned above (PP, p II/12). The data needed to generate these outputs were to be obtained from a number of energy audits, short-term on-site training sessions, installation of a few fossil-fuel saving prototypes, and technical publications, with ISERST as the implementing agency. This included a "one month study tour to a number of countries having a proven track record in energy conservation" for the chief of the ISERST energy section (PP p II/13). Outputs envisioned included:

- A number of "model sites" established for demonstration of energy-saving technologies with installation of a few prototypes;

- Short-term training courses for industry representatives;

- A contribution to the national development plan;

- A set of documents to study and promote conservation.

Underlying the conservation concerns were four assumptions:

- The GROD would commit itself to setting a long-term quantitative target for conservation

- A National Energy Commission would be established and the Directorate of Planning would provide limited recurrent budget support for ISERST to undertake energy audits and to set up demonstration sites

- Guidance and agreement to fund trainees in ISERST short-term training programs would be provided by other interested agencies

- The GROD would provide ISERST with a skilled Djiboutian mechanic for at least three years to assist the project engineer and architectural consultant in taking energy audit measurements, and subsequently be able to assume responsibility to carry on conservation practices.

In addition to the "model sites" mentioned, a model energy-saving building was to be constructed for the Earth Sciences Division of ISERST, with the assistance of a short-term architectural consultant (2 person months) and a U.S. A/E firm to design the building and to draw up the plans.

This approach and the tasks listed above were based on a variety of assumptions that can be summarized briefly as: 1) continued and increasing interest and commitment on the part of the GROD; and 2) a doubling of the U.S. direct-hire staff from one to two. (PP,II/6)

The goal of the activities described is stated as "a fully functioning Energy Section within the Earth Sciences Division [in the Office of the President] consisting of a host-country chief, a host-country assistant, and over 5 trained counterpart staff members." (PP,II/6) Reaching this goal was to be the task of a contractor whose chief of party (COP) would serve for the entire project (4 person years). Additional assistance to be provided by AID was also envisioned.

Finally, two conditions precedent to disbursement of funds were set. These were: 1) that the GROD procure the building site; and 2) that the GROD identify and have funding to hire the Djiboutian counterpart to the VITA COP. (PP,II/25)

2. History of the Project

Following authorization of the project on June 8, 1981, the Project Agreement (ProAg) was signed with the GROD on July 16, 1981. The better part of a year elapsed before AID entered into a contract with Volunteers in Technical Assistance (VITA) on June 22, 1982, with a contract period of four and one-half years. The contractor's COP, Stephen Hirsch, arrived on the scene October 9, 1982, and began work in office facilities provided by USAID. (AID also provided housing and household furnishings for the first two years.)

Construction of the new building to house the Energy Division of ISERST began in June, 1983, and the staff moved into the as yet uncompleted building in mid-September, 1984.

Several amendatory actions have been taken since the project was authorized, not all of which have had any significant effect on the contract. In mid-May, 1982, a PIO/T was issued that made changes in some sections of the PP. (The one significant change effected in this PIO/T seems to have been the elimination of the solar-energy specialist from the list of technical specialists to be hired.) The second change was a supplementary agreement to the contract, dated July 30, 1982. It provided minor financial changes, including the obligation of an additional $6,250 to make a new contract total of $1,306,250.

The third change was an amendment to the ProAg, dated September 23, 1982, that increased the GROD's commitment of resources to the equivalent of $1,345,000 (up from $660,000), including the value of contributions in kind. At the rate of exchange used by the U.S. Embassy, this is equivalent to DF239,410,000. In spite of the GROD's agreement to this figure, the validity of this change is somewhat clouded by the fact that it was preceded by a letter from the U.S. Ambassador, dated September 13, informing the GROD that notwithstanding the language of the agreement, the USG would nevertheless consider that the GROD's commitment was limited to approximately DF40,000,000.

The fourth change, which constituted the second amendment to the contract, was effective on November 9, 1982, and obligated an additional $2,000,000 to make a fully funded contract amount of $3,306,250. It also provided authority for the contractor to hire additional personnel.

Finally, a contract amendment, effective February 27, 1984, modified the level of effort and added an untitled job description. In addition, it modified the budget by shifting and renaming some categories, while keeping the same fixed fee and total contract amount.

Aside from the items noted above, one other change was made in the contractor's responsibilities, although it was never incorporated in the contract as an amendment. The priorities to be followed by the contractor and the annual work plan were modified in a memorandum from REDSO/ESA (Wes Fisher) to USAID/Djibouti and VITA, dated March 8, 1983. One of the more significant changes was the modification and narrowing of the number and kind of prototype interventions, in recognition that some of the activities envisaged in the PP were simply not appropriate in Djibouti.

3. AID Boundary Conditions

The constraints set by AID on this evaluation were few. The major caveat was that AID has made no provision for additional funding beyond current obligations. Within this condition, the team was asked to consider the most efficient ways of using funds currently available, including the possibility of extending the Project Activity Completion Date (PACD). AID/W also indicated that consideration should be given to enhancing the conservation component as compared with the renewable-energy component. Finally, AID/W made very clear its interest in developing possible cooperation with other donors to ensure project impact beyond the project completion date.

B. EVALUATION

This "mid-term" evaluation, originally scheduled to take place in July, 1982, was done in December, 1984 with a three-member team consisting of the following:

Norman L. Brown, Renewable-Energy Specialist, (Chief of Party)
Meta Systems Inc.
Cambridge, MA
(Base of operations Washington, DC)

Alain Streicher, Energy-Conservation Specialist,
Hagler, Bailly Company
Washington, DC

D. Michael Bess, Energy Economist/Planner
Energy/Development International
Washington, DC
(Base of operations Nairobi, Kenya).

1. Evaluation Objectives

The objectives of this evaluation, as described by AID/W, were to evaluate progress, consider possible activities for the remainder of the project, and recommend ways for AID best to spend the remaining project funds.

2. Evaluation Methodology

Within our individual time constraints, the members of the evaluating team interviewed critical personnel in VITA, ISERST, other GROD agencies, other donor agencies and groups active in Djibouti, and local commerce and industry. The team's efforts were aimed at evaluating:

- Current project status with respect to:
  + renewable-energy activities
  + energy-conservation activities
  + institutional capabilities
  + training

- Progress relative to contract obligations

- Effects of external factors on:
  + project setting
  + priorities (either USAID or GROD)

- Project inputs
  + quantity
  + quality
  + timeliness

- Outputs
  + progress relative to projected goals
  + causes for delays
  + significant management experience
  + changes needed to achieve goals

- Beneficiaries

- Unplanned effects.

In view of the anticipated focus on conservation, the evaluation emphasized conservation activities with a view to:

- Appraising the appropriateness of their focus and scope

- Identifying their characteristics

- Determining their effectiveness to date

- Identifying obstacles to implementation

- Determining the need for changes in technical and budgetary requirements

- Identifying elements that other donors might wish to support

- Recommending priority areas for support after project completion.

3. Structure of the Report

The report presents the results of analysis of the information in the areas listed above in the form of detailed findings for the major Project categories, followed by conclusions and recommendations.

As a result of our widely disparate bases of operation and prior commitments, the members of the evaluating team were not able to work together in Djibouti for the entire time within the country, to meet together to discuss individual findings at the end of that period, or to meet as a group to discuss our individual final reports. This evaluation report, therefore, is a synthesis, by the Chief of Party, of the three individual final draft reports, and represents as nearly as possible a consensus of the entire team.

III. DETAILED FINDINGS

A. INPUTS

1. Training

The Contractor has conscientiously devoted considerable effort to providing training opportunities for ISERST staff, with significant success. Mostly as a result of the unavailability of qualified staff and staff turnover, however, counterpart and on-the-job training has been essentially ad hoc. Nonetheless, the Contractor has made extensive, and on the whole successful, attempts to involve ISERST staff in training, ranging from English language instruction, driver education, computer programming, and on-the-job technical training, to counterpart training in Mali, the U.S. (University of Florida), France (Lyons), Senegal, and VITA headquarters. In addition, other Djiboutians, including both GROD officials and one private individual cooperating with ISERST/VITA in use of waste oil, have been sent to Tanzania and France for training in areas as diverse as energy management and kiln construction. Training in conservation, involving three ISERST staff members was substantial, although it was limited to on-the-job training during Jarmul's energy-auditing consultancy.

Within Djibouti, the Contractor has provided training and practical experience for ISERST staff members in the following activities:

- Solar-pump installation and repair
- Windmill repair and installation
- Fabrication of bricks with local materials
- Brick construction techniques
- Installation and operation of photovoltaic systems.
- Energy-auditing techniques
- Use of waste oil as a fuel
- Use of computers.

On a more mundane level, the Contractor has provided driving lessons for the staff, as well as courses in English. The Contractor has also broadened the concept of training, combining it with education and information dissemination, by conducting lecture demonstrations throughout the country (solar pumping, earth-brick fabrication and construction), seminars (energy auditing), television broadcasts (energy auditing, energy conservation), assistance to the Lycee in the form of equipment and information (photovoltaics), and providing information for seven newspaper articles on project activities.

2. Equipment

As of October 30, 1984, the Contractor had provided over $180,000 worth of equipment to the project, including prototype equipment, workshop equipment, laboratory equipment, and office furnishings and equipment. In addition. USAID supplied slightly over $87,000 worth of equipment and vehicles from its project budget. Items provided under the contract included:

- 1 solar pump
- Extra PV panels, lamp, fan for Lycee installation
- 2 Sparco windmill pumps
- Windmill repair parts
- Tools
- Computer
- 3 meteorological stations
- 2 Cinva Ram presses.

Equipment costs do not include the photovoltaic system installed on the new building, since this was included in construction costs. [It should be noted that the AID-supplied equipment included four Climatronics meteorological stations, purchased before the COP's arrival. It was in the interests of standardization and commonality of spare parts, therefore, that the Contractor purchased the additional four units.]

3. Consultancies and Technical Services

A major part of the Project inputs has been in the form of consultancies from both hired experts and VITA Volunteeers. The importance of the contribution of the latter to the Project's cost efficiency should not be underestimated. Thus far, four Vita Volunteers have provided consultant services to the project, in the field, for a total of approximately 4.5 person-months with an estimated saving of approximately $22,000 in fees. One Volunteer even paid his own travel costs. (This estimate does not include the value of VITA Volunteers' contributions in the form of advice through the home office or the value of the time and effort saved by the Contractor in avoiding the need to engage in contracting procedures to obtain these services.)

In sum, the Project has provided expert consultants in the following areas:

- Energy assessment
- Energy conservation
- Energy auditing

- Use of local building materials
  - + brick making
  - + construction techniques

- Windmill repair/maintenance

- Use of waste oil as a fuel

- Waste-oil furnace construction.

- Energy auditing

B. OUTPUTS

1. Institutional Development

In terms of institutional development, project outputs can be summarized succinctly. To date, the Energy Initiatives Project has succeeded in:

- Assisting the institutional development of the Institut Supérieur d'Etudes et de Recherches Scientifiques et Techniques (ISERST)

- Gaining the attention and interest of donors, government of Djibouti officials, and private-sector individuals concerning issues of energy supply and conservation.

- Providing AID, other donors, the GROD, and private Djiboutians with a good picture of energy supply and end-use patterns and suggested actions/interventions to alleviate the country's energy problems.

- Engaging donors, GROD officials, and private-sector individuals in addressing and resolving energy issues.

Project personnel have worked with virtually all agencies concerned with energy supply, conversion, and consumption in Djibouti. Accompanying the successes there have been some disappointments, as is to be expected. Nevertheless, the project's overall impact on institution building in Djibouti has been significantly positive.

Institut Supérieur d'Etudes et de Recherches Scientifiques et Techniques (ISERST) - The Project Paper called for the Contractor to work closely with ISERST to develop institutional capabilities for research and technology testing and development, training of key personnel in the Earth Sciences Service of ISERST, and the design and construction of an energy-efficient building to house the Earth Sciences Service. The Contractor has addressed these targets with some successes, as noted above, and some disappointments. The most important achievement of the Project with respect to ISERST is the elevation of that institution, in the eyes of Djiboutians and the expatriate community, to the status of a national leader in energy

research, testing, and education. As a result of the efforts to provide training and education to ISERST staff, the confidence level of staff personnel -- particularly that of the Homologue Chef du Projet (Counterpart Project Director) -- has been raised, with a consequent improvement in efficiency and ease of dealing with problems as they arise. The achievement of driving ability alone contributed significantly to the rise in the level of confidence of the staff by improving the technical staff's mobility and making management of the many details of the Project easier.

The Project operated one year without a Counterpart Project Director. Problems were also encountered in recruiting other qualified technical staff. This sould be viewed within the context of newly independent Djibouti's limited base of skilled and educated manpower and the fact that a highly dedicated and enthusiastic counterpart was eventually assigned the second year of the Project. Although there has been some turnover in the ISERST staff, the benefits of the project's impact on current ISERST personnel is apparent, as noted above.

The quality of the Project's effectiveness with ISERST is measured by the high level of awareness on the part of the public of ISERST activities associated with the Project. The major weakness, as with training, has been a lack of focus and continuity. The more positive aspects of the Contractor's work with ISERST, particularly conservation and mechanical-equipment repair and maintenance (renewables), should be focussed upon in the latter half of the Project. However, it is not clear that ISERST is the best mechanism to work with on development of an energy-conservation program. (See below, B.5 Conservation.)

The greatest problem encountered with respect to ISERST has been the completion of the ISERST Earth Sciences Building. As a result of performance failure (followed by bankruptcy and disappearance) of the French building-construction contractor, completion of the building has been set back over a year. In addition, part of the work already done is not satsifactory, in spite of repeated attempts by the COP to have these faults corrected before the financial collapse of the building contractor. Now, the COP is faced with having to deal with numerous subcontractors whose work has not been completed and most of whom have not been paid by the building contractor for work already done, a responsibility not envisioned in the contract and one that is only exacerbating the distractions caused by the contractor's collapse. It would seem, therefore, to be in AID's best interests if it would step in and relieve the COP of the burden of legal maneuvering and subcontract renegotiation, not only because this has distracted the COP from substantive tasks relating to his responsibilities under the contract, but because this is a situation involving the U.S. Government and its relations with both host-country nationals and foreign companies doing business in Djibouti. All effort should be made to resolve this situation and complete the building as soon as possible to enable the Contractor and Djiboutian staff to move ahead on other aspects of the Project.

Travaux Publics - The Contractor was charged in the Project Paper with working with Travaux Publics (TP). This agency should be concerned with conservation activities through its Direction de l'Urbanisme et du Logement (for buildings) and through it responsibility for transportation. The Contractor has expended considerable effort to involve TP in many facets of

the Project. These have included training a TP technician on energy auditing, engaging TP personnel in prototype energy-efficient housing design, and considerable contact with TP's Direction de l'Urbanisme et du Logement (including TP's liaison with the IBRD's Housing and Urban Development Project), as well as seeking and obtaining assistance in materials testing, and extended discussions with building-standards staff.

Travaux Publics has provided testing services for the Project's prototype building materials (Cinva Ram-stabilized soil-cement bricks) and will probably continue to provide such services upon request. On the basis of past experience, however, it should not be expected that TP will assume a more active role during the life of this Project. Nevertheless, the Contractor should continue to engage TP officials in dialogue on issues of energy conservation and energy-efficient prototype housing. (See below, B.5 Conservation.)

Service de l'Energie - This newly created agency in the Ministere de l'Industrie et du Developpement Industriel is a one-man operation consisting of one economist, the Chef du Service (Director), who previously worked as an assistant to the National Planning Directorate. It did not exist at the time either the Project Paper or the Contract was written, although the PP foresaw the creation of some energy-planning agency in the Ministry of Industry and called for the Contractor to be involved with that agency in the development of a national energy data base. (Such a planning group was actually informally created during the National Energy Assessment, and provided valuable guidance during the Assessment. This group no longer meets.)

The Contractor attempted unsuccessfully to involve the Service de l'Energy in the first phase of the National Energy Assessment. The Director of the Service did become involved during the Second Phase, but several members of the second-phase team stated that such involvement was not very active. According to the Chief of Party, however, the Service played a significant role in the development of the Assessment data base and in facilitating contacts with various groups and individuals during the second phase.

The Assessment recommends the provision, through the Contract, of a one-year technical advisor to the Service de l'Energie. The estimated cost for such an advisor was given as $125,000. Discussions with the Director made it perfectly clear that he has no staffing plans, no budget plans, and no coherent strategy for the Service, let alone a strong idea of the role for such an advisor. The Director indicated that such plans are awaiting the recommendations of a government committee currently reviewing the National Energy Assessment. This committee consists of a number of representatives from various ministries and agencies, most of whom were members of the advisory committee created to coordinate Phase II activities of the assessment, and a series of meetings is planned for January and February to establish government priorities. Final government decisions are expected by March, after which the Service de l'Energie could then have a well defined mission, a work plan, a budget, and a staff (probably including one assistant to the Director). Thus, while we feel that some form of assistance should be provided by the Project to the Service, we feel it is premature to consider this recommendation of the Assessment at this time.

Electricité de Djibouti - Neither the Project Paper nor the Contract called for the Contractor to work with Electricite de Djibouti (EdD). Thus, the working relationship that has developed between ISERST/VITA and EdD is one of the unforeseen benefits that has emerged during Project implementation. This relationship with EdD staff has grown out of the Chief of Party's desire to involve key energy actors/agencies in the Project and in the development of the data base for the energy assessment. Relations with EdD to date appear to have been good, with EdD providing ample assistance to the Contractor on the National Energy Assessment.

It should be noted here that the Minister of Industry indicated clear priority on extending energy supply through modernization of EdD's electricity production and expansion and development of geothermal resources.

Génie Rural - This agency is responsible for maintaining rural water points, among other things. However, it faces many of the same problems as other GROD agencies -- a limited number of technically qualified staff, low salaries, and few incentives built into the system to encourage initiative and field work. The PP and the Contract called for the Contractor to work with Génie Rural on issues of prototype renewable-energy technologies, primarily photovoltaics and windmill pumps. The Contractor has made considerable effort to involve Génie Rural in these areas, and a collaborative working relationship has been established and seems to be growing. Until recently, Génie Rural restricted its cooperation with ISERST/VITA to providing spare parts for windmill repair, because of the agency's reluctance to send technicians into the field to assist the Contractor in repair and maintenance of windmill pumps. Through persistance and good relations with Génie Rural's administration, however, the Contractor succeeded in gaining an agreement with Genie Rural (4 Dec., 1984, Accord de Cooperation between GR and ISERST/VITA) to participate in the up-country repair of windmills in northern Djibouti. Génie Rural fielded a technician for a one-week operation with ISERST/VITA in December, 1984.

Although Genie Rural has been cooperative in providing spare parts for windmill repair, it is questionable whether that cooperation can be extended to assuming an active role in maintaining and servicing the up-country pumps repaired and/or installed by the Project. Therefore, some other mechanism seems indicated, such as getting District Commissioners to assign local mechanics or involving private voluntary organizations (PVOs) such as CIRD or Volontaires du Progres, in maintaining and servicing these up-country pumps.

In addition, a three-way cooperation has been established that includes the Agence Française pour la Maîtrise de l'Energie (AFME). This organization has offered to supply three PV pumps for a collaborative ISERST/Génie Rural experiment, on a cost-sharing basis that seems particularly advantageous. AFME's offer includes on-site services and other valuable assistance in analysis of results.

2. Cooperation with Other Donor Institutions

Agence Française pour la Maîtrise de l'Energie - In addition to the collaborative activity with Genie Rural noted in the previous section, the Contractor has developed further cooperation with AFME. As a result of visits

by both the Project COP and the French adviser of Génie Rural to AFME in Paris, AFME has recently offered ISERST/VITA three solar pumps and a photovoltaic refrigerator, on very generous terms, for field testing and use.

World Bank (IBRD) - The World Bank is acting as the lead agency in a $15- million multilateral Housing and Urban Development project is aimed at providing affordable and energy-efficient housing in heavily populated and housing-deficient urban areas in Djibouti. The project includes a $5.5-million grant from AID and is currently focussing on construction of several hundred houses in Salines Ouest. The COP has attempted to have some of the results of Dunham's research on energy-efficient housing included in the design of the houses for this project. The Bank, however, has not yet indicated if it would take into consideration suggestions made by Dunham to the French architectural firm (in November, 1984) to modify initial designs that did not incorporate any energy-efficiency considerations.

The Bank also is currently funding an economic planning project staffed by three foreign experts. The Resident Representative, who was interviewed during the mission, said that to his knowledge the Bank was not considering funding any energy-related activity beyond its current geothermal project.

3. Data Base

During the course of the Project, the Contractor has made an excellent start on establishing an energy-related data base, and an energy documentation center. The material being collected can be grouped into three categories:

- Measurements
    - + meteorological data (wind velocity, insolation, temperature, relative humidity, rainfall)
    - + data on operation of windmill pumps, solar pumps
    - + data collected during various consultancies (energy conservation, local building materials, waste-oil use, construction techniques, windmill repairs)
- Information Related to Policy and Planning
    - + data collected during the National Energy Assessment
    - + information collected by the COP and staff on various aspects of Djiboutian life (including business activities and donor involvement)
- General Information
    - + books, articles, papers, professional journals
    - + catalogs.

A library has been set up and preparations have been made for

improving its information-retrieval capabilities. The arrangement has become so attractive to ISERST that the Director plans to move the entire Earth Sciences library collection to the new building and put the operation under the care of a full-time librarian.

The major accomplishment in establishment of a data base is, of course, the National Energy Assessment. The Assessment consisted of two phases and resulted in the development of an extensive data base on energy supplies, conversion, and end use. The information collected on conservation issues is particularly important and will be discussed in section 5 below.

4. Renewable Energy

The role to be played by renewable-energy technologies in this project has not been clear from the start of the Contractor's involvement. The Project Paper places great emphasis on renewable energy as a project component, making provision for six pilot interventions (the only interventions envisioned in the PP) and budgeting $605,000 for commodities associated directly with renewable-energy ($490,000 of that for the interventions alone). The Contract is a little less categorical, but vacillates between emphasizing the importance of renewable-energy technologies and recognizing that the justification -- whether economic, social, or political -- for the use of specific renewable-energy systems might be lacking in some circumstances. On the one hand, the Contractor's Scope of Work notes that "the project concentrates on data gathering and analysis and on the development of suitable renewable energy equipment under a variety of circumstances to be found in Djibouti" as a means of providing alternative energy sources. It requires the Contractor to "identify, adapt and install" alternative-energy equipment that has a potential for "wide-spread use within Djibouti," and the COP's Job Description requires him to "develop plans and implement programs to stimulate commercial marketing of renewable energy equipment." On the other hand, the COP's Job Description requires him to reexamine the relationship of the Project's "currently proposed interventions" to its primary and secondary goals, and to propose modifications or substitutions "appropriate to the objectives" of the Project. In addition, the Assessment Specialist is required to perform a market analysis for the potential application of renewable-energy technologies. Thus, while the Contract continues the emphasis on renewables found in the Project Paper, it sets the stage for modifying that stance should the circumstances call for it.

Both the Contractor and AID are to be commended for recognizing that much of the intitial emphasis on renewable energy was simply not appropriate to Djibouti, as has been borne out by the results of the National Energy Assessment, and for eliminating four of the six interventions originally planned.

Data Base - There are, to be sure, some situations where renewable-energy systems make sense in Djibouti; thus, the solar- and wind-data collection program was well designed and justified. The value of this program has been diluted, however, by the mechanical and electronic problems the ISERST staff has been experiencing with the Climatronics measuring/recording equipment. These problems were apparent from visits to several of the data-collection stations and from examination of the

maintenance log, and they have cast doubt on the validity of some of the data collected. Furthermore, they raise the question of the value of continuing this activity if, with a reasonable expenditure of time and money, the problems cannot be cured.

Windmill Pumping - Visits to two of the windmill pumps repaired and refurbished by ISERST/VITA showed these systems to be operating smoothly and providing useful amounts of water to the irrigated garden plots they serve. More important, the experience of the ISERST staff with these systems, and the cooperation that has begun with Génie Rural, demonstrate the ability of ISERST to repair these systems if the District Commissioners can be persuaded to cooperate by providing mechanical services for maintenance.

Solar Pumping - The one solar-pumping installation that could be visited was functioning smoothly and was much more appropriately sized than the diesel pump originially installed at the site. In a small country like Djibouti, where communication by road is generally not too onerous, it would seem to be difficult to justify the use of photovoltaic-pumping systems. The justification (economic, environmental, social, political) for such systems, however, is strongly site specific and is particularly dependent on the availability of diesel fuel and repair services in remote areas. Nevertheless, there are specific situations where conditions favor PV-pumping systems, such as the one in Asa-Eyla, for example, where the recharge rate of the well is not large enough to sustain the pumping capacity of even the smallest commercially available diesel pump. Thus, the proposed cooperation with AFME (See Section 2 above) seems well worth pursuing, in order to provide an opportunity to gather economic, maintenance, and pumping data at a minimum cost to the Project.

In sum, we agree with the Assessment's conclusions regarding windmill and solar pumping, viz., that the limited volume requirements and low-lift conditions in Djibouti may indeed make windmill and solar pumping least-cost options in some circumstances, but that one should not expect a substantial portion of water pumping to be performed by these methods (particularly photovoltaics) in light of current and projected costs.

5. Conservation

After numerous interviews with all parties concerned with the conservation component of this Project, and after review of pertinent documents, we feel that a substantial fraction of the energy-conservation activities envisioned in the Project Paper had been conducted as of December, 1984. [The Project Paper surprisingly considers industry as an important target for conservation efforts. Actually, the industrial sector is very small and limited to a handful of non-energy-intensive facilities. The residential and commercial sectors constitute much more important targets.] This achievement becomes significant when evaluated within the context of the priorities set by AID on the ISERST building and the data-base component during the first two years of the Project.

Project achievements as of December, 1984 can be summarized briefly:

- Preparation of a manual on energy-conserving construction

techniques for Djibouti by VITA architect consultant Dan Dunham and engineer Judy Hirsch

- Contribution of Dunham to design of new ISERST building and preparation of bid package, subsequently completed under contract by architect Bernard Cazaban

- Eight-week consultancy by energy auditor, Seymour Jarmul, with training of counterpart staff and transfer of metering equipment

- Support to construction of a ceramic kiln using waste oil as fuel in collaboration with the Ministry of Commerce, Transport and Tourism

- Completion of an air-conditioning analysis for the ISERST building in collaboration with VITA home office and volunteers

- Development of plans to design and build 5-10 low-cost, energy-efficient housing units integrating results and recommendations from Jarmul's consultancy

-Detailed analysis of the potential for conservation in all sectors and development of recommendations during the National Energy Assessment

- Evaluation of energy-efficient light bulbs

- Assistance to private sector in manufacturing local bricks as substite for energy-intensive cement blocks, using waste oil as fuel

- Second consultancy of architect Dunham to review preliminary drawings for IBRD-sponsored housing project.

Conservation activities not yet covered consist of:

- Model sites with demonstration/prototypes

- Short-term training course to industry

- Assistance to industry

- Trip of ISERST chief to several countries with good track record of conservation.

With an estimated $238,000 budgeted for conservation activities, Contract expenditures in this area so far have been about $195,000, or 82 percent. The activities noted above that have not yet been carried out would cost an estimated $42,000, and thus could probably be conducted within the remaining budgeted Contract funds. (Some model sites, as proposed in the PP, would cost about $20,000 if demonstrations/prototypes are limited to lighting, insulation, and other housekeeping measures; one short-term training course and assistance to industry would cost not more than $15,000, as the industrial base in Djibouti is very small; and the trip of the ISERST chief would cost no

more than $7,000, making a total of about $42,000.]

The discussion that follows will deal with the various institutions involved in the Project's conservation component.

ISERST - In the course of this Project, ISERST has become increasingly interested in energy conservation. Recognizing the limited short-term impact of renewables on the national balance of payments, the ISERST director wishes to refocus the Project on conservation activities. Within ISERST, as noted above, the Counterpart Project Director and two technicians became familiar with and received training in energy-conservation possibilities and techniques in buildings during Jarmul's consultancy, including training in energy auditing, and are familiar with the use of the auditing instruments brought by Jarmul, which are kept at ISERST. Our discussions and interviews in Djibouti indicate clearly that ISERST is perceived by other institutions as the logical and competent leading institution to conduct energy-conservation activities in Djibouti.

Nevertheless, it is not clear that ISERST is indeed the best institution to undertake the lead role in Djibouti's conservation activities. The director and the staff understand the importance of this work but recognize the institution's limitations, not only in personnel and skills but also because of its role in the Government. Thus, if a group is formed within ISERST to carry out these activities, a well organized program of training will have to be included, but it should be recognized that ISERST may not be the permanent location of such an activity.

Travaux Publics - During the course of this evaluation, it became apparent that Travaux Publics has little interest or capability in assuming a leading role in establishing energy-efficient housing-design standards, providing energy-auditing services, or incorporating the Project's work on energy-efficient prototype housing and development of use of local materials. A number of reasons were mentioned, including uncertainty about costs and benefits of energy-conservation measures, lack of support in public and private sectors for such measures (energy has a very low priority despite its high cost), and need for Electricite de Djibouti to demonstrate its commitment to energy conservation first, by cutting its own production costs and prices to set an example, prior to promoting energy conservation among users.

Electricité de Djibouti - The Assessment and this evaluation foresee a much stronger Project relationship with EdD in the area of Power Sector Conservation. EdD is very supportive of any effort serving the national interest, including energy conservation, and EdD's director has provided and will continue to provide exceptionally strong support to the AID/ISERST/VITA Project.

Savings of several hundred-million francs (Djiboutian) are expected in 1985 and 1986, by reducing operating costs 25-30%. Steps being taken are:

- Modernizing the production and distribution system by:
  - installing 2 new 15-MW diesel generating sets
  - using heavier (and cheaper) diesel generating oil
  - increasing distribution voltage from 20 kV to 63 kV in

some sections
+ installing power-factor correction devices

- Taking advantage of favorable spot purchase of oil (1985 contracts will same DF2,000 ($12) per tonne of oil.).

Between 1981 and 1984, EdD has been running at a loss (DF450 million ($2.6 million) in 1982) that is covered by a subsidy from the national budget. EdD is very open to modifying its current rate structure, which includes declining blocks for commercial and industrial customers, to a more conservation-oriented structure with flat or increasing blocks. In addition, EdD would provide institutional support to a customer-oriented auditing service. Financial assistance to customers wishing to take conservation measures (e.g., rebate programs, cost-sharing agreements) is beyond EdD's current financial capabilities, but it could become an option by 1986. Unfortunately, the current EdD director will be retiring in June, 1985, and it is uncertain if his successor will place such a high priority on load management. EdD's interest in load management to reduce the summer peak and to spread loads more evenly on an hourly and seasonal basis, is likely to stay. Assistance in this area was proposed in the National Energy Assessment by VITA's specialist (Shibu Dhar) and also by the French AFME, and a collaborative accord for technical assistance to be shared between AID and AFME is acceptable to all parties.

Ministère du Commerce, du Transport et du Tourisme - This ministry currently provides full support to the Project's effort to promote the use of waste oil (lubricant) for its ceramic kilns and other industrial applications. Although the ministry sees these efforts more in terms of stimulating new local business (there is currently no commercial ceramic activity in Djibouti due more or less to the high cost of fuel), it indirectly supports energy conservation, as waste oil has the potential of displacing oil currently being imported. For example, Coubeche, the largest industrial complex in Djibouti (ice plant, Coca Cola bottling plant), has indicated a strong interest in modifying its burners to use waste oil in lieu of diesel fuel. In addition, the Coca Cola bottling plant manager expressed interest in testing use of solar water heaters to provide hot water for bottle washing.

Fonds d'Assistance et de Cooperation (FAC) and Agence Française pour la Maîtrise de l'Energie (AFME) - Both French organizations have indicated keen interest in collaborating with the Project in various areas, including conservation, mainly for housing and electricity generation (EdD). Based on findings of the National Energy Assessment, AFME has recently proposed to ISERST/VITA that it assist EdD in load management.

Data Base - The conservation-related information collected by the National Energy Assessment is particularly important. The Assessment focuses on EdD power-factor improvement and the advantages of switching to heavier oil (cost $2 million, first-year savings $3.3 million), and electricity conservation in buildings. The potential for this has been estimated at 20-30 percent in existing buildings on the average, and up to 50 percent for new construction as compared with existing building performance. Savings in the transportation sector are estimated at about 10 percent.

The Assessment suggested the following activities:

- Setting up an audit team for buildings

- Implementing one or two pilot projects in government office buildings

- Establishing a loan program for conservation retrofits

- Conducting a media campaign

- Promoting energy-efficient new buildings by building several prototype houses and revising building codes

- Retrofitting street lighting with high-pressure sodium lamps

- Government use of fuel-efficient vehicles

- Conducting a comprehensive road transport study.

Most of these recommendations -- except those related to EdD, which are already being implemented, and that for the loan program, which is best replaced by financing from the Caisse de Développement (see below) -- are sound but must be prioritized. (See IV. Conclusions and Recommendations.)

Promotion - Public promotion of the Project's useful results has taken place, with a television presentation of Jarmul's findings in late 1983 (with two repeat broadcasts) and several newspaper articles dealing with waste-oil use among other things. Nevertheless, more promotional activities are needed. The distribution of the Assessment and of Jarmul's and Dunham's reports, which was to have been completed by the end of 1984, is likely to have a significant impact on raising awareness of a variety of decision makers in the government and the private sector, if it is well targeted. The reports very clearly indicate potential savings of 20-80 percent in extreme cases. Unfortunately, there has been no follow up or additional audits conducted by the trainees after Jarmul's departuare. A brief survey of Djiboutian awareness of energy-conservation practices showed that little, if anything, was known about the possibilities and their costs and benefits.

Private Sector - The private sector should be a major beneficiary of conservation measures. To date, however, there has been no great direct benefit because of the Project's limited scope in this area and the fact that it has had other priorities. Nonetheless, there have been some significant indirect benefits. The search for energy-efficient air-conditioning equipment for the ISERST building has benefitted, and will probably continue to benefit, the local supplier of the selected appliances. Also, work done on the use of waste oil and local construction materials is likely to benefit a much larger private audience than their current private promoters, who are being assisted by the Project.

Financing and Financial Incentives - Although private banks (e.g., Banque pour le Commerce et l'Industrie Mer Rouge) cannot provide attractive financing for energy conservation, a newly created (1982) semi-government financing institution (Caisse de Developpement de Djibouti -- CDD) has the

authority and is willing to provide financing for investments in energy conservation for the residential, commercial, and industrial sectors with attractive terms (8 percent interest rate, grace period during construction).

It must be noted that the major energy consumers (Coca Cola plant, military installations, commercial buildings, and large air-conditioned houses and hotels) have sufficient financial resources to invest in such activities, which generally pay back in a few months. Nonetheless, such investments are not being made. One of the reasons that apply to a large fraction of the Djiboutian high-income households is that they do not pay for their electric bills, which often exceed $1,000/month. These bills are paid by their employers as part of the expatriate fringe-benefit package. Furthermore, since most of the large energy-using houses are rented, their owners are reluctant to invest in something that would not result in direct benefits to them. Finally, the demand for such housing, with a high level of comfort, exceeds supply.

IV. CONCLUSIONS AND RECOMMENDATIONS*

A. INSTITUTIONAL RELATIONS AND PROJECT MANAGEMENT

The Energy Initiatives Project has been successful to date from a number of points of view. It has had a beneficial effect on Djibouti by setting the stage for a program of energy-efficiency improvement and conservation that could result in annual foreign-exchange savings of millions of dollars over the next decade.

- The Contractor has engaged GROD officials and local Djiboutians in all phases of Project implementation.

- The Contractor has fulfilled virtually all of the terms of reference in the Contract.

- The Contractor has maintained constant liaison with USAID in all phases of Contract implementation.

- The Contractor has operated under difficult conditions in a newly independent country to impart training to government officials, encourage Djiboutian and other donor participation in defining problems and possible solutions, and developing manpower resources.

- All interviewees speak of the positive role of the contractor on issues of institution building, conservation-information dissemination, and public education. This has resulted in a positive higher profile of ISERST.

- The Contractor has exceeded his terms of reference as outlined in the PP, Contract, or ProAg in private-sector involvement, interdonor cooperation, interagency (GROD) dialogue, waste-oil use, use of local building materials, and housing prototype initiatives.

These accomplishments should be seen in the light of the contradictory nature of the PP and the different signals that have been given to the Contractor since project start-up. Foremost among the contradictions is the difference in perceptions among AID, the Contractor, and Djiboutians implicit in the French and English titles of the ProAg; i.e., "Energie Renouvelable" (Renewable Energy) Project in the French title and text, and "Energy Initiatives" in the English.

It speaks well of the Contractor's Chief of Party that he has been able to satisfy both the Djiboutians and AID through his performance within the context of these differing perceptions. However, satisfying those differ-

*In this section, estimated costs marked • indicate costs in addition to funding already provided in the Contract. These additional funds are assumed to be available from reallocation of funds from the $564,750 remaining in USAID's Project budget.

ing perceptions and the extremely broad set of outputs called for in the PP, the Contract, and subsequent revisions of the contract (including, most importantly, the March 8, 1983 revisions that have never been incorporated into an amendment or PIL) has led to a certain lack of project focus and, more significantly, lack of follow up.

To date, the Energy Initiatives Project has succeeded in:

- Assisting the institutional development of the Institut Supérieur d'Etudes et de Recherches Scientifiques et Techniques (ISERST)

- Gaining the attention and interest of donors, GROD officials, and private-sector individuals concerning energy-supply and conservation issues.

- Providing AID, other donors, the GROD, and private Djiboutians with a good picture of energy supply and end-use patterns and suggested actions/interventions to alleviate the country's energy problems

- Engaging donors, GROD officials, and private-sector individuals in addressing and resolving energy issues.

The Contractor's Chief of Party (COP) has developed an extensive information and contact base that has rendered the project very effective in engaging key policy makers and actors in Djibouti in dialogue on energy-related matters. This "institutional memory" will be hard to supplant. It speaks well of the COP's approach to the project that, from the outset, key Djiboutians, donor representatives, and expatriates have been apprised of virtually all phases of the project's activities.

The evaluation team understands that the Contractor's COP expects to be replaced soon. The following two recommendations are designed to minimize the potential negative effects on the Project and on energy development in Djibouti if the current COP does indeed depart.

RECOMMENDATION No. 1 - THE CHIEF OF PARTY'S REPLACEMENT SHOULD SPEND AT LEAST ONE MONTH IN COUNTRY WITH THE COP PRIOR TO THE LATTER'S DEPARTURE FROM DJIBOUTI. The COP and his replacement should strive to maintain as much continuity as possible during the transition. While the COP can define the importance of these contacts better than anyone else, at a minimum the following people should be introduced to his replacement:

- The representative of FAC

- The representative of AFME

- The Director of EdD

- The Director of EPH (Etablissement Public des Hydrocarbures)

- Relevant officials in Travaux Publics

- The in-country Director of the IBRD Housing and Urban Development project

- Relevant officials of Génie Rural

- Key donor contacts

- Key private-sector contacts.

Furthermore, in view of the recommended project reorientation, emphasis on experience and interest in conservation should be given in the selection of the new COP.

ESTIMATED COST $10,000

RECOMMENDATION No. 2 - THE CHIEF OF PARTY'S DJIBOUTIAN COUNTERPART SHOULD ASSUME AN INCREASINGLY RESPONSIBLE ROLE IN PROJECT MATTERS AND SHOULD BE INVOLVED IN ALL INTRODUCTORY MEETINGS SET UP BY THE COP FOR HIS REPLACEMENT. The COP has involved his counterpart in a wide range of activities. The transfer of management responsibility entailed in the change of Chiefs of Party should enable the project counterpart to assume an even more active role in project matters that will lead to the type of institution building foreseen during the design of the project.

ESTIMATED COST -- 0 --

The project has suffered from a lack of coherent guidance from AID and conflicting signals/directions (contained in the PP itself, and followed by subsequent changes in priorities) on Project objectives. Overemphasis on the construction and completion of the ISERST building has distracted the Contractor from other activities called for in the PP, the Contract, and subsequent amendments. While the Contractor has engaged in numerous positive interventions, comprehensive follow up in areas that show promise (e.g., energy conservation in the residential and commercial sectors, energy-efficient prototype housing, construction, testing and dissemination, etc.) has not been possible so long as the ISERST building problems have continued to be outstanding and the Contractor's Scope of Work has remained unmodified. The immediate priority, therefore, is the resolution of the outstanding problems on completion of the construction of the ISERST building. This will allow the Contractor to focus more on other issues and work that have been identified during this evaluation. The COP's priority task should be to assist the GROD to establish energy-conservation capabilities and to liaise with AID and other donors in this field.

RECOMMENDATION No. 3 - AID SHOULD PROVIDE THE CONTRACTOR WITH A MODIFIED WORK PLAN AND AN AMENDED CONTRACT THAT FOCUS THE CONTRACTOR'S EFFORTS IN THE FOLLOWING PRIORITY AREAS:

- Energy conservation (e.g., developing Djiboutian energy-auditing capabilities) in the residential/commercial sectors

- Dissemination/information sharing in energy efficiency and conservation measures that can be taken in the residential and commercial consumer sectors

- Donor cooperation to assist the public utility with a power-sector conservation program, building on steps already being taken, including improving power factor, potential for utilizing heavier fuel oil, etc.

- Donor cooperation for incorporating energy planning in national development-planning exercises (i.e., coordinate consultancies and technical assistance with the IBRD/UNDP National Planning Project)

- Introduction of prototype energy-efficient housing designs developed under the project as a means of influencing the IBRD Housing and Urban Development (HUD) project, which is funded in part ($5.5 million) by an AID grant.

The work plan should, however, include pursuit of certain renewable-energy activities, as discussed below.

ESTIMATED COST -- 0 --

Finally, priority attention should be given to resolving, as soon as possible, outstanding problems concerning the completion of the ISERST building. This will enable the contractor to continue work called for in the PP, the ProAg, the Contract, and any amended work plan that results from this evaluation.

RECOMMENDATION NO. 4 - AID SHOULD SERIOUSLY CONSIDER RELIEVING THE CONTRACTOR OF THE BURDEN OF LEGAL MANEUVERING AND SUBCONTRACT RENEGOTIATION, NOT ONLY BECAUSE THIS HAS DISTRACTED THE CHIEF OF PARTY FROM SUBSTANTIVE TASKS RELATING TO HIS RESPONSIBILITIES UNDER THE CONTRACT, BUT ALSO BECAUSE THIS IS A SITUATION INVOLVING THE U.S. GOVERNMENT AND ITS RELATIONS WITH BOTH HOST-COUNTRY NATIONALS AND FOREIGN COMPANIES DOING BUSINESS IN DJIBOUTI.

ESTIMATED COST* $100,000

During the course of the National Energy Assessment (see below), an ad hoc committee was formed to establish some sort of coherent policy by which the assessment should be guided. This committee constituted the first attempt within the GROD to examine energy-related issues in a coherent fashion.

RECOMMENDATION No. 5 - THE AD HOC COMMITTEE CONVENED TO STEER THE ASSESSMENT SURVEY SHOULD BE ESTABLISHED AS AN ON-GOING POLICY STEERING COMMITTEE TO ADDRESS MAJOR ISSUES RELATED TO DJIBOUTI'S NATIONAL ENERGY ECONOMY AND RECOMMEND POLICY MEASURES TO EFFECT CHANGES IN THE COUNTRY'S ENERGY USE AND ECONOMIC DEVELOPMENT. This committee comprised representatives of the EPH, EdD, the Service de l'Energie, and other agencies and provided the project's assessment team with invaluable guidance and assistance. More importantly, however, these individuals became engaged in policy dialogue. Experience in other countries shows this to be an effective policy tool for effecting changes in the national energy economy.

A suggested first forum for convening this committee would be to review the findings of the Assessment and to discuss its implications. It would perhaps be a useful vehicle to encourage the IBRD/UNDP Planning Project to sponsor a roundtable conference on the Assessment; the composition of the committee could be determined at this roundtable conference. It would be extremely useful to encourage all of Djibouti's donors to participate in such a forum.

ESTIMATED COST	-- 0 --
TOTAL ESTIMATED ADDITIONAL COST(*)	$100,000

B. DATA BASE

The Energy Initiatives Project conducted Djibouti's first National Energy Assessment. The Assessment consisted of two phases and resulted in the development of an extensive data base on energy supplies, conversion, and end use. The report's major weakness stems from its voluminous detail and its lack of a conclusions section that is succinct and easily read by the lay reader. The following recommendations would improve the usefulness of this major piece of work.

RECOMMENDATION No. 6 - A CONCISE, EASILY READ SUMMARY OF THE RESULTS OF THE NATIONAL ENERGY ASSESSMENT SHOULD BE PREPARED IN FRENCH. A summary should be prepared that follows a format such as: "Were the Government of Djibouti to reduce kerosene subsidies by DF3 per liter, government expenditures could be reduced by $155,000 per year." Alternatively: "Raising diesel-fuel surcharges by 20% over the next five years would result in an increase in government revenues of over $2 million per annum by 1990." Furthermore, the summary should be organized with subtitles such as: "Kerosene Pricing Policies," "Foreign-Exchange Savings through Residential- and Commercial-Energy Conservation." A ten- to fifteen-page text that lays out these issues and recommendations for action would be of considerable value to many policy makers and individual consumers in Djibouti. As the Assessment text now stands, the reader is taken through a step-by-step process of how calculations were made. More often than not, the benefit and cost information is contained in

extensive tables that make it difficult for the reader to develop conclusions to support the non-quantified text.

The Assessment should be revised carefully, as several discrepancies of some significance occur in the present text. (For example, government kerosene subsidies are stated to be DF3 per liter (p. 226) when, in fact, such subsidies (subventions) amount to DF16.52 per liter.) Several facts of considerable importance are absent in the report; e.g., the GROD charges EdD a 28% surcharge (import tax) on all fuel sold on contract to the utility. In view of the fact that fuel costs comprise approximately 55% of EdD's total production costs, this amounts to an increase to the consumer, on a pro rata basis, of over 15%.

Nevertheless, the Assessment contains a wealth of information and has provided Djibouti with an excellent initial data base for policy discussions and planning. This information must be presented, however, in as effective a manner as possible to enable the reader to come to conclusions and to set the stage for dialogue. Moreover, recommendations contained in the Assessment (e.g., raising the price of diesel fuel, eliminating part of the subsidy on kerosene, etc.) should be substantiated, where the case is made, by quantitative facts or other information.

A carefully developed distribution list should be prepared for this summary.

ESTIMATED COST $5,000

Examination of several of the meteorological data-collection stations and the contractor's maintenance log leads to the conclusion that this part of the data-base establishment should be cut off unless certain conditions are met. The history of troubles with the Climatronics units, both mechanical and electronic, and the unreliability of the wind data in particular, make it not worth the effort of the contractor and his staff to continue this activity under present conditions. This is particularly unfortunate because the wind data so far available give tantalizing indications of the potential to generate electicity in some areas. Furthermore, if any further activity is to be undertaken by the GROD to develop agriculture, to mount afforestation projects, or to take advantage of advances in the technology of the use of solar ponds to generate electricity, data on rainfall, temperature, relative humidity, and insolation would be useful.

RECOMMENDATION No. 7 - A QUALIFIED EXPERT SHOULD BE BROUGHT IN TO SEE IF THE PRESENT METEOROLOGICAL DATA-COLLECTION EQUIPMENT CAN BE MADE MORE RELIABLE AND MAINTENANCE FREE. IF THIS IS NOT POSSIBLE, THE DATA-COLLECTION PROJECT SHOULD BE STOPPED AND THE EQUIPMENT DISMANTLED AND STORED. If VITA is unable to locate an appropriate expert among its Volunteers, AID should look into the possibility of obtaining the services of a DOE expert, under the AID/DOE RSSA, to examine the Climatronics instruments to see if they can be modified to make them reliable. Pending this action, ISERST/VITA

should continue their current procedures. If either option is taken and the pending visit is delayed beyond three months, the data-gathering activity should be suspended until such time as the expert arrives and is able to solve the problem. If VITA is unable to identify and procure the services of a Volunteer, and if AID is unwilling to pursue this matter with DOE, the meterological data-collection project should be stopped and the equipment dismantled and stored at the ISERST laboratory against possible future repair. One complete station should be set up at the laboratory, however. This installation would be much easier to keep functioning because of its location and the daily oversight possible. It would therefore provide more reliable data, and would serve as a useful training tool for the staff. The remaining instruments would serve as a source of spare parts.

ESTIMATED COST* $5,000 - $10,000

RECOMMENDATION No. 8 - ISERST/VITA SHOULD CONSIDER INSTALLING AT LEAST ONE SET OF INSTRUMENTS IN PROTOTYPE LOW-COST HOUSES, IF THE DECISION IS TAKEN TO BUILD SUCH EXPERIMENTAL STRUCTURES ON THE ISERST GROUNDS. (See "Conservation.") These instruments would measure temperature, relative himidity, and insolation, providing information that would be valuable in the design of such housing. However, this project should be undertaken only if such experimental prototypes are on the ISERST grounds because of the necessity of close and frequent supervision of the equipment.

ESTIMATED COST* 0 - $500

The library collection seems to be proceeding smoothly. The only concern is that the proposed microfiche system may become outdated in the near future. The alternative would be to rely on computer access to existing and future data bases, but this does not seem practical after VITA's involvement ends. Nevertheless, as the document (as opposed to microfiche) collection grows, it will become useful to take advantage of the existing computer facilities to establish a computerized catalog index of the library's holdings.

RECOMMENDATION No. 9 - ISERST/VITA SHOULD CONTINUE ITS CURRENT APPROACH TO BUILDING LIBRARY FACILITIES AND ESTABLISHING AN ENERGY DOCUMENTATION CENTER. IN ADDITION, VITA SHOULD PURSUE THE MICROFICHE APPROACH RECOMMENDED IN THE NATIONAL ENERGY ASSESSMENT. FINALLY, VITA SHOULD IDENTIFY AND ACQUIRE AN APPROPRIATE DATA-BASE MANAGEMENT SYSTEM TO INDEX THE LIBRARY'S HOLDINGS OF BOOKS, DOCUMENTS, AND CATALOGS.

ESTIMATED COST $5,000

TOTAL ESTIMATED ADDITIONAL COST(*) $5,000 - $10,500

C. RENEWABLE ENERGY

It is clear to all parties concerned that the use of renewable-energy resources and technologies will not have a significant impact on Djibouti's overall national energy costs, in view of the population distribution and energy-use patterns. Nevertheless, there are specific situations in which this approach makes sense; thus, continuation of some activity in this area is justified. Furthermore, there is a small but significant fraction of the population that is apparently still dependent on biomass -- charcoal and firewood -- as cooking fuel. Therefore, the following recommendations are made with the understanding that conservation efforts remain the first priority.

Solar Fish Drying and Smoking - The decision to eliminatae these two prototype/interventions was a wise one: the available fish stocks have not yet been determined; there is no evidence that the market for smoked or dried fish has been established; and the experience with solar fish dryers in other AID projects (e.g., Senegal) has been disastrous. Therefore, we see no need to pursue this issue.

Wind-Energy Conversion Systems - The decision not to install a wind-powered electricity-generation system was correct in view of the fact that there were no data to support such an installation at the time. Although there are indications that wind-electric systems might usefully be installed in some areas, the data that have been collected by the meteorological instruments are not reliable enough to justify a trial. Although we feel this activity should not be pursued further, we recognize the possibility that the results of Recommendation No. 7 might suggest such a project. In that event, however, we suggest that it be considered as a follow-on project after the PACD of the Energy Initiatives Project.

Windmill water pumping, on the other hand, has proved its usefulness in several situations in Djibouti. Although the problem of maintenance will always exist, the work done thus far by ISERST/VITA in repairing and refurbishing windmill pumpers has been successful and has provided useful training for ISERST staff. The collaboration of Genie Rural and the Lycee de l'Enseignement Professionel (LEP) in supplying repair parts and facilities further indicates the value of continuing this activity.

> **RECOMMENDATION No. 10** - ISERST/VITA SHOULD CONTINUE THE WINDMILL-PUMPING ACTIVITY, STRENGTHENING THE GROWING COLLABORATIVE RELATIONSHIP WITH GENIE RURAL. This should include the continuation of its evaluation and repair of windmill-pumping systems in the districts of Obock and Tadjourah, as suggested in the National Energy Assessment (p. 24b).

ESTIMATED COST $5,000

Noting the recommendation of the Assessment team that a demonstration windmill pumper be set up at the site of the new ISERST building, we think that the Sparco machine currently being repaired for this use is too small to serve as a demonstration for any use other than to supply drinking water for a family and water for a small number of livestock.

RECOMMENDATION No. 11 - WE RECOMMEND THAT ISERST/VITA PROCURE AND INSTALL A FAN-WHEEL WINDMILL PUMPER (8 FEET OR MORE IN DIAMETER) OVER A WELL TO BE DUG AT THE ISERST SITE. As noted in the Assessment (p.245), the assembly, installation, and testing of this machine would serve as a valuable training exercise for ISERST and Genie Rural staff. The location at ISERST would avoid the burden of travel and field maintenance for all concerned during this training stage.

ESTIMATED COST $20,000

RECOMMENDATION No. 12 - IN VIEW OF THE WORLDWIDE WINDMILL-PUMPING MEASUREMENT AND MONITORING NETWORK BEING SET UP BY THE WORLD BANK IN COLLABORATION WITH THE UNDP, VITA SHOULD CONTACT THE RENEWABLE ENERGY UNIT IN THE BANK'S ENERGY DEPARTMENT TO DISCUSS THE POSSIBLE INCLUSION OF DJIBOUTI IN THIS PROGRAM. If this could be arranged, valuable services -- and perhaps equipment -- would be provided at no cost to the Project. Furthermore, it would provide valuable contacts for ISERST personnel within this worldwide network, in addition to the benefit of the experience of others.

ESTIMATED COST -- 0 --

RECOMMENDATION No. 13 - ISERST/VITA SHOULD EXPAND THE CURRENT WORKSHOP FACILITIES TO INCLUDE THE MACHINE TOOLS REQUIRED TO REPAIR AND FABRICATE THE SMALL PARTS THAT MOST OFTEN MUST BE REPAIRED OR REPLACED IN WINDMILL-PUMPING SYSTEMS. Although valuable machine-shop services have been supplied by LEP, we feel that the value of developing skills and a degree of autonomy within ISERST outweighs continued complete reliance on LEP for these services. Expanding current shop facilities in this manner would also entail building up a modest supply of materials such as cold-rolled steel and aluminum bar, sheet, and angle stock.

ESTIMATED COST* $10,000

RECOMMENDATION No. 14 - IN ORDER TO PUT THE WINDMILL-PUMPING ACTIVITY ON A FIRM PERMANENT FOOTING, WE RECOMMEND THAT ISERST/VITA SEND ONE OF ITS TECHNICAL STAFF MEMBERS TO A WIND TRAINING PROGRAM IN THE UNITED STATES, SUCH AS THE ONE GIVEN AT THE UNIVERSITY OF NEW MEXICO. WE ALSO SUGGEST THAT A TECHNICIAN FROM GENIE RURAL, WITH THEIR AGREEMENT, BE INCLUDED IN THIS TRAINING PROGRAM, TO STRENGTHEN FURTHER THE COOPERATION AND INTEREST OF GENIE RURAL IN THIS AREA.

ESTIMATED COST* $5,000 - $10,000

Photovoltaic Pumping - One of the major accomplishments of this project has been the establishment of a collaborative relationship with Génie Rural that seems to be strengthening. In addition, a three-way cooperation

has begun that includes the Agence Française pour la Maîtrise de l'Energie (AFME). This organization has offered to supply three PV pumps for a collaborative ISERST/Genie Rural experiment, on a cost-sharing or cost-free basis that seems particularly advantageous. AFME's offer includes on-site services and other valuable assistance in analysis of results.

> RECOMMENDATION No. 15 - AID SHOULD APPROVE THIS PROPOSED COOPERATIVE ACTIVITY AND ISERST/VITA SHOULD PROCEED WITH THE NECESSARY AGREEMENT, TAKING ADVANTAGE OF GENIE RURAL'S INTEREST IN THIS ARRANGEMENT. ALONG WITH THE INCEPTION OF THIS ACTIVITY, VITA SHOULD MAKE FULL USE OF THE RESULTS OF THE WORLD BANK/UNDP SOLAR PUMPING PROJECT IN ESTABLISHING EVALUATION METHODOLOGY AND IN COMPARING RESULTS.

ESTIMATED COST $5,000

Photovoltaic Refrigeration - The Assessment noted the potential value of using PV refrigerators in rural dispensaries in place of kerosene-fueled refrigerators currently in use, and recommended procuring and testing five or six models. Information gathered during this evaluation, however, indicates that the rural dispensaries are located in the District capitals, all of which are supplied with electricity. This use of PV refrigerators, therefore, does not seem appropriate. The argument has also been made that frequent power outages in the non-European quarters of Djibouti Ville might justify PV refrigerators in the clinics located in these areas. However, with current and planned improvements in electricity supply in the city (see Section IIIB5, EdD), this application does not appear appropriate either.

> RECOMMENDATION No. 16 - THE ASSESSMENT RECOMMENDATION TO TEST PHOTOVOLTAIC REFRIGERATION (p. 249) SHOULD NOT BE FOLLOWED.

Solar Water Heaters - The conclusion of the Assessment that although "water heating is not a necessity for average household use, there are several potential applications for solar water heaters in the commercial and government sectors," remains valid.

> RECOMMENDATION No. 17 - ISERST/VITA SHOULD FOLLOW THE SUGGESTION OF THE ASSESSMENT AND PROCURE THREE COMMERCIALLY AVAILABLE SYSTEMS, PREFERABLY THROUGH A LOCAL SUPPLIER, AND PROCEED WITH THE TESTING AND DEMONSTRATION SUGGESTED. IN ADDITION, ISERST/VITA SHOULD PURSUE THE EXPRESSED INTEREST OF THE LOCAL COCA COLA BOTTLING COMPANY IN THE USE OF SOLAR WATER HEATERS TO SUPPLY HOT WATER FOR BOTTLE WASHING, BY PROPOSING A SMALL-SCALE PILOT/DEMONSTRATION.

ESTIMATED COST* $10,000 - $15,000

Biomass As an Energy Resource - The two recommendations of the Assessment that deal with this issue (pp. 223, 224) pose a dilemma for this Project. They are based on two concerns that are fundamentally linked -- the source and quantity of fuelwood and charcoal used in the rural areas (and in Djibouti Ville), and the problem of tree and bush growth in such a hot, arid

country. The dilemma arises because, while a study of the supply and use of charcoal and firewood is a proper activity to be considered under this Project, a study of afforestation and range management is not within its scope.

RECOMMENDATION No. 18 - AS RECOMMENDED IN THE ASSESSMENT, A STUDY OF THE SUPPLY AND USE OF FUELWOOD AND CHARCOAL SHOULD BE MADE. If an expert with the appropriate combination of skills and experience can be identified and his/her services obtained, this study could include a preliminary gathering of data that could be used in eventual design of a future project devoted to the issue of forest cover and range management. In any event, the fuelwood/charcoal study will complete the picture of Djibouti's energy-supply and -use patterns.

ESTIMATED COST* $15,000 - $20,000

RECOMMENDATION No. 19 - NOTWITHSTANDING THE RECOMMENDATION IN THE ASSESSMENT, AID SHOULD NOT PURSUE THE QUESTION OF FOREST COVER AND RANGE MANAGEMENT UNDER THIS PROJECT. Nevertheless, taking note of USAID's concern over the results of its previous project with the Soils Laboratory, we suggest that, if the situation in the Service de l'Agriculture improves in the future, AID consider two options that deal with the problem of afforestation and range management: 1) consideration of a future project, in cooperation with USDA, working with the Service de l'Agriculture and Génie Rural; or 2) encouraging the UNDP to pursue this issue with FAO, perhaps in a project jointly funded by FAO, FAC, AFME, and USAID.

ESTIMATED COST -- 0 --

TOTAL ESTIMATED ADDITIONAL COST(*) $40,000 - $55,000

D. CONSERVATION

As noted earlier, preoccupation with problems associated with construction of the new ISERST building has detracted from the time the Contractor should have spent on conservation activities called for in the PP. More attention should be paid to energy conservation in the residential and commercial sectors. Indeed, the major focus of the Contractor's efforts and the Project budget should be in this area, as noted in RECOMMENDATION No. 3. The establishment of an energy-auditing team, a public-education campaign on conservation, creation of a mechanism for household and commercial-establishment retrofits, convening a standing energy-policy committee, and seeking funds for improvements in the efficiency of the power sector should be the primary objectives for the remainder of the project.

Despite extremely high energy prices and consumption in Djibouti (gasoline costs about $2.20/gallon and electricity prices average $0.23/kWh), tremendous energy wastes occur. As a rough estimate, about 25 percent of total energy currently used in Djibouti could be economically and financially saved (that is, with a payback of one year or less). This saving rate

corresponds roughly to a potential reduction in annual oil imports of 25,000 tonnes, worth $5 million. Information from the users' side shows that, for a variety of institutional reasons, including lack of priority given by government institutions (except ISERST), there is no significant energy conservation in Djibouti.

Currently, ISERST is seen as the most appropriate organization to lead a national effort. Unfortunately, it is not officially in a postion to enforce policy. Neither Travaux Publics nor the Service de l'Energie is likely to develop either an adequate interest or the capability to substitute for ISERST in the near future. Consequently, ISERST will have to continue to lead conservation efforts at least until the Service de l'Energie establishes a work plan (with luck, during the second quarter of 1985). Jarmul, the Contractor, and the evaluation team all agree on the need for an Energy Conservation Unit to give technical advice on conservation measures and to coordinate conservation acitivities in Djibouti. The Unit should be formed and remain within ISERST until and unless the situation in the Service de l'Energie warrants transfer to that agency.

RECOMMENDATION No. 20 - - AN ENERGY-CONSERVATION UNIT (ECU) SHOULD BE FORMED FROM A CORE OF THREE ISERST TECHNICIANS CHARGED SOLELY WITH PROVIDING AUDIT SERVICES AND RECOMMENDING CONSERVATION MEASURES TO ELECTRICITY CONSUMERS. THIS UNIT SHOULD RECEIVE TRAINING THROUGH A SERIES OF CONSULTANCIES, WITH EQUIPMENT NECESSARY FOR CONDUCTING AUDITS, AND BY PARTICIPANT TRAINING ABROAD, AND SHOULD HAVE A STRUCTURED MANDATE FOR ITS SERVICES. Training should include several short-term technical-assistance missions in commercial and industrial energy-audit practices; conservation project implementation, including demonstration, should be planned for 1985 and 1986. At least three ISERST technicians (including the Homologue Chef du Projet) should be trained, both in classrooms and on the job, and should devote at least 75 percent of their time to energy-conservation acitivties. Training should be in conjunction with the establishment of 3-4 demonstration sites (residences, commercial establishments). Personnel from the Service de l'Energie and Travaux Publics may also be included in this on-the-job training.

The short-term consultancies, each of three to four weeks, should be scheduled for early 1985, mid-1985, and late 1985 or early 1986 and should set out, in conjunction with ISERST and Project staff, a manpower-training plan for the ECU and other staff. The primary focus should be on energy-auditing techniques, providing essential equipment to conduct those audits, and on training staff. Five to ten detailed energy audits of selected public and private buildings should be conducted by the ISERST audit team, in coordination with EdD, before the end of 1985, under the guidance of a VITA specialist. The first consultancy would be to work with the ECU staff in identifying the demonstration sites, establishing monitoring/auditing methodologies, and laying out a work plan for three to six months. The next consultancy would entail evaluation of monitoring/auditing results and recommendations on retrofitting the demonstration sites for

energy conservation. The third consultancy would be to evaluate the results of monitoring/auditing the retrofitted demonstration sites (see Recommendation 22 below), the performance of the ECU staff, and to identify further training needs. Results from the demonstration tests should be disseminated through national media.

Private-sector individuals, other GROD agencies (e.g., Travaux Publics, Service de l'Energie) should be involved, if interested, in all phases of the training and technical assistance. Particular attention should be paid in selecting the demonstration sites with an eye towards encouraging agencies such as TP and EdD to apply standards to existing establishments and setting codes for future construction. This should involve no additional cost; however, if sufficient interest has been generated in these other agencies, additional in-country training might be warranted and a cost would have to be assigned.

ESTIMATED COST* 1985 $50,000
1986 $30,000

RECOMMENDATION No. 21 - ONE OR TWO ISERST TECHNICIANS AND REPRESENTATIVES FROM PRIVATE CONSTRUCTION/RETAIL, INSTALLATION COMPANIES SHOULD RECEIVE PRACTICAL TRAINING IN RETROFITTING EXISTING BUILDINGS AND HOUSES, INCLUDING INSTALLATION OF INSULATION AND CHANGING AIR-CONDITIONING SYSTEMS (THIRD AND FOURTH QUARTER, 1985).

ESTIMATED COST* $15,000

RECOMMENDATION No. 22 - ON THE BASIS OF THE AUDIT RESULTS AND IN COLLABORATION WITH THE OTHER CONCERNED INSTITUTIONS, ISERST/VITA SHOULD SELECT THREE TO FOUR SITES FOR IMPLEMENTING AUDIT RECOMMENDATIONS, TO BE USED AS DEMONSTRATIONS, IN LATE 1985 OR EARLY 1986. Each site may host several projects (e.g., lighting, insulation). One of the demonstrations should use a flat-plate collector solar water-heating system (e.g., hospital, laundry, or food-processing plant). These demonstration sites should include two residences (e.g., one high-income or expatriate residence and one middle-income Djiboutian residence) and one or two commercial establishments (e.g., local quartier shop and central large commercial establishment). The purpose of these pilot demonstrations is to establish the potential energy and monetary savings that could be realized through easily implemented conservation techniques.

ESTIMATED COST* $100,000

RECOMMENDATION No. 23 - THE DIRECTOR OF THE ENERGY CONSERVATION UNIT SHOULD RECEIVE TRAINING IN ENERGY CONSERVATION AND MANAGEMENT AT TVA'S FACILITY AND/OR ARTHUR D. LITTLE'S "ENERGY MANAGEMENT PROGRAM" IN BOSTON. (BOTH PROGRAMS ARE FUNDED, IN PART, BY AID.)

ESTIMATED COST* $10,000 - $15,000

The consultancy of Seymour Jarmul resulted in identification of areas for Project intervention and assistance to the GROD, other donors, and private individuals (and firms) concerning residential and commercial end-use conservation. Jarmul and the ISERST/VITA team's audits provided good illustrative information on the costs and benefits of building and residence retrofitting. This information has been universally well received and was commented upon extensively by interviewees during the course of this evaluation. To date, however, distribution of the report seems to have been essentially ad hoc. Many interviewees had heard of the report, but had not received copies.

RECOMMENDATION No. 24 - THE RESULTS AND RECOMMENDATIONS OF JARMUL'S REPORT SHOULD BE STUDIED CAREFULLY BY AS WIDE AN AUDIENCE AS POSSIBLE. A WELL THOUGHT OUT DISTRIBUTION LIST SHOULD BE PREPARED AND COPIES OF THE FRENCH VERSION OF THE REPORT ("REDUCING ENERGY CONSUMPTION IN BUILDINGS: THE POTENTIAL FOR CONSERVATION IN DJIBOUTI") SHOULD BE PROVIDED TO A WELL PLACED AND CONCERNED AUDIENCE.

ESTIMATED COST $1,000

Interest among users for energy conservation is very low. There is very little local private capability either to inform the public and the administration about the benefits of energy conservation, or to implement retrofitting measures in the residential, commercial, and industrial sectors.

The project has demonstrated the potentially great impact of residential and commercial energy conservation. Work carried out under the consultancy of Jarmul (also Dunham's work on housing design) fulfilled the PP's ambiguous call for attention to conservation (Output 4, Project Issues, p. 1/3). It is clear, from Jarmul's audits and from visits conducted during this evaluation, that these measures (housekeeping, insulation, change of equipment) have a very high payoff, generally between one month and one year, because electricity, which is the major source of energy to be saved, is very expensive. According to Jarmul's study, typical investment costs for retrofitting vary between $100 and $1,000 for houses and individual offices, and between $5,000 and $25,000 for buildings such as retail stores and hotels. These investments are well within the reach of most users. Extrapolation of the audit results shows that, for Djibouti as a whole, about $2-3 million in investment would be needed, only about $300,000 of which is for housing retrofitting, or roughly $50,000 per year if one assumes a period of six years to catpure the economic potential. Even if this amount of capital is not available in equity to the users, they can apply to the Caisse de Developpement and obtain a loan at 8 percent interest. Therefore, financing does not seem to be a problem in Djibouti; identifying what has to be done, who can do it, and convincing people to do it are the real issues.

RECOMMENDATION No. 25 - ISERST SHOULD APPOINT A STAFF MEMBER TO BE RESPONSIBLE FOR COORDINATING AND PROMOTING ENERGY CONSERVATION AND

DISSEMINATING RESULTS FROM THE PROJECT'S CONSERVATION EFFORTS. THIS INDIVIDUAL SHOULD SPEND APPROXIMATELY 50 PERCENT OF HIS/HER TIME DURING THE LATTER HALF OF 1985 AND ALL OF 1986 ON THESE TASKS. ISERST SHOULD PLAY A KEY ROLE IN INFORMING INDIVIDUALS AND ORGANIZATIONS ABOUT EXISTING SERVICES AVAILABLE TO THEM, INCLUDING FINANCING FROM THE CAISSE DE DEVELOPPEMENT.

ESTIMATED COST -- 0 --

Data collected during the Jarmul consultancy, during the course of the project, and through the National Energy Assessment show considerable room for improvement in the areas of reducing household and commercial electricity bills as well as the possibility for significant national energy savings. Djibouti has influential news media (press, radio, television) that have actively publicized project activities and information, to date.

RECOMMENDATION No. 26 - AN EXTENSIVE, WELL THOUGHT-OUT PUBLIC/CONSUMER EDUCATION CAMPAIGN SHOULD BE INITIATED ON RESIDENTIAL- AND COMMERCIAL-SECTOR ENERGY CONSERVATION. ISERST SHOULD, WITH ASSISTANCE FROM VITA, DEVELOP AN AGGRESSIVE CONSERVATION PROMOTION PROGRAM FOR 1985, INCLUDING PREPARATION OF BROCHURES, PAMPHLETS, TV AND RADIO SPOTS, POSTERS, STICKERS, AND CONFERENCES.

ESTIMATED COST*

1985	$30,000
1986	$20,000
1987	$10,000

RECOMMENDATION No. 27 - ISERST/VITA SHOULD INITIATE/SPONSOR A NATIONAL EXHIBITION OF ENERGY-EFFICIENT APPLIANCES AND EQUIPMENT BY MID-1985.

ESTIMATED COST* $5,000

RECOMMENDATION No. 28 - A DIRECTORY OF ENERGY-EFFICIENT SERVICES AND PRODUCTS AVAILABLE IN DJIBOUTI SHOULD BE PREPARED BY ISERST/VITA BY MID-1985.

ESTIMATED COST* $5,000

RECOMMENDATION No. 29 - ISERST SHOULD APPROACH THE MINISTER OF INDUSTRY AND THE MINISTER OF PUBLIC WORKS (TP) TO OBTAIN THEIR AGREEMENT TO CO-SPONSOR A SEMINAR AIMED AT RAISING AWARENESS OF ENERGY EFFICIENCY AMONG TOP-LEVEL GOVERNMENT EMPLOYEES (FIRST QUARTER 1985).

ESTIMATED COST -- 0 --

RECOMMENDATION No. 30 - DONORS, PARTICULARLY THE FRENCH (WHO HAVE A LARGE EXPATRIATE COMMUNITY IN DJIBOUTI) SHOULD BE APPRISED OF THE SUBSTANTIAL SAVINGS (EASILY 20%) AVAILABLE THROUGH SIMPLE CONSERVATION METHODS AND RELATIVELY INEXPENSIVE RETROFITTING. The majority of large residential consumers are expatriates. Many, if not most, of these consumers do not pay their own utility bills -- their employers do. Most expatriate housing is rented and most expatriates have virtually no incentive (rather, considerable investment-cost disincentive) to retrofit their houses or to conserve electricity. A simple audit, coupled with straightforward cost/benefit analysis of residences, would demonstrate to expatriate employers the advantages of conservation and retrofitting. (Paybacks of six months or less would be quite easily achieved.)

ESTIMATED COST -- 0 --

In view of its major contribution to the IBRD Housing and Urban Development Project, AID has an excellent opportunity to encourage the use of energy-conservation techniques is housing construction in Djibouti.

RECOMMENDATION No. 31 - ISERST/VITA SHOULD BUILD TWO OR THREE LOW-COST, ENERGY-EFFICIENT HOUSES AT THE SITE OF THE NEW ISERST EARTH SCIENCES BUILDING, TO BE MONITORED BY ISERST STAFF (SEE RECOMMENDATION No. 8) AND TWO OR THREE OTHERS AT SALINES OUEST TO ASSIST THE IBRD-SPONSORED HOUSING AND URBAN DEVELOPMENT PROJECT IN ADOPTING ENERGY-CONSERVATION STANDARDS FOR ITS CONSTRUCTION (STARTING EARLY 1985).

ESTIMATED COST* $100,000

RECOMMENDATION No. 32 - ISERST SHOULD CONTINUE PROMOTING THE USE OF WASTE OIL FOR EQUIPMENT CURRENTLY BURNING PREMIUM FUELS (1985-1986).

ESTIMATED COST* $7,000

RECOMMENDATION No. 33 - ISERST AND THE SERVICE DE L'ENERGIE SHOULD APPROACH AFME TO REQUEST ASSISTANCE FOR DESIGNING AND IMPLEMENTING AN ENERGY-CONSERVATION PROGRAM IN THE TRANSPORTATION SECTOR (SECOND QUARTER 1985).

ESTIMATED COST -- 0 --

RECOMMENDATION No. 34 - ISERST SHOULD RECOMMEND THAT EACH GOVERNMENT ORGANIZATION (e.g., MINISTRIES, AGENCIES, COMMISSIONS) HAVE RESPONSIBILITY FOR ENERGY EXPENDITURES FROM ITS OWN BUDGETED FUNDS. Government organizations should set annual conservation targets (e.g., 5 percent of the previous year's budget) that will reduce energy consumption and generate savings that can be used

for other purposes (such as equipment purchases or building improvements).

ESTIMATED COST -- 0 --

RECOMMENDATION No. 35 - ISERST SHOULD WORK WITH TRAVAUX PUBLICS TO DEVELOP BUILDING STANDARDS FOR ENERGY EFFICIENCY IN NEW CONSTRUCTION, TO BE ENFORCED BY TRAVAUX PUBLICS.

ESTIMATED COST -- 0 --

RECOMMENDATION No. 36 - ISERST SHOULD WORK WITH THE APPROPRIATE GROD AGENCIES TO ESTABLISH ENERGY-EFFICIENCY CRITERIA FOR EVALUATION OF PROPOSALS/BIDS FOR INDUSTRIAL PROJECTS AND TO ESTABLISH IMPORT STANDARDS FOR ENERGY-EFFICIENT ELECTRICAL EQUIPMENT, DEVICES, AND FIXTURES.

ESTIMATED COST -- 0 --

Finally, with the new focus on conservation activities recommended in this Evaluation, more time will be required to complete the planned activities than was anticipated in the PP and Contract as they were written.

RECOMMENDATION No. 37 - THE PROJECT ACTIVITY COMPLETION DATE (PACD) SHOULD BE EXTENDED FOR ONE YEAR. IN ADDITION, THE PRESENT CONTRACTUAL LIMITATION ON CONSULTANCIES OF 22 PERSON MONTHS SHOULD BE AMENDED TO A FIGURE CONSISTENT WITH THE RECOMMENDATIONS FOR ADDITIONAL ACTION IN THIS EVALUATION THAT ARE ACCEPTED BY AID. The additional time is needed for promotion, preparation, demonstration, implementation, and evaluation of the recommended actions. These recommended actions also necessitate amending the current limitation on consultancies to make the Contract reasonably consistent with the implications of the recommendations evaentually adopted by AID. The recommended extensions and the activities they provide for can be financed with the Project funds still unexpended. (See Summary of Recommendations.)

TOTAL ESTIMATED ADDITIONAL COST(*) $382,000 - $387,000

OVERALL ADDITIONAL COST(*) FOR ALL RECOMMENDED ACTIONS $527,000 - $552,500

EXHIBIT 1

SUMMARY OF RECOMMENDATIONS

RECOMMENDATION	TIMING	COST UNDER CURRENT CONTRACT	ADDITIONAL COST
INSTITUTIONAL RELATIONS AND PROJECT MANAGEMENT			
1. COP Overlap	1985	10,000	-
2. Greater role for Homologue	1985	-	-
3. New Work Plan	1985	-	-
4. USAID take over construction renegotiations	1985	-	100,000
5. Energy Policy Committee	1985	-	-
	Subtotals	$10,000	$100,000
DATA BASE			
6. French Summary, National Energy Assessment	1985	5,000	-
7. Repair of meteorological stations	1985	-	5,000 - 10,000
8. Install measuring instruments in prototype housing	1985-1986	-	0 - 500
9. Library data base	1985	5,000	-
	Subtotals	$10,000	$5,000 - 10,500
RENEWABLE ENERGY			
10. Windmill pumping	1985-1987	5,000	-
11. New windmill pumper	1985	20,000	-
12. IBRD/UNDP network	1985-1987	-	-
13. Expand workshop	1985	-	10,000
14. Windmill training	1985	-	5,000 - 10,000
15. AFME cooperation, PV pumping	1985-1987	5,000	-
16. PV refrigeration	-	-	-
17. Solar water heating	1985	-	10,000 - 15,000
18. Fuelwood and charcoal study	1985-1986	-	15,000 - 20,000
19. Forest cover study	-	-	-
	Subtotals	$30,000	$40,000 - 55,000

CONSERVATION

20. Training, Energy Conservation Unit	1985-1986	-	80,000
21. Training, retrofitting	end 1985	-	15,000
22. Retrofit prototype/ demonstrations	end 1985/ 1986	-	100,000
23. Training, ISERST chief (and head of SdE?)	mid 1985	-	10,000 - 15,000
24. Distribution of Jarmul's report	1985	1,000	-
25. ISERST PR coordinator	1985	-	-
26. Promotional campaign	1985-1987	-	60,000
27. Energy-efficiency exhibition	end 1985	-	5,000
28. Directory, energy-efficient products and services	mid 1985	-	5,000
29. Seminar	1985	-	-
30. Informing donors	1985	-	-
31. Donor financing	1985-1987	-	-
32. Low-cost housing demonstration units (IBRD HUD project)	1985	-	100,000
33. Waste oil use	1985	-	7,000
34. Transportation	1985-1986	-	-
35. Recommendations to GROD	1985	-	-
36. Building code modifications	1985-1986	-	-
37. Import criteria		-	-
	Subtotal	$1,000	$382,000 - 387,000
Total Cost of Recommendations		$51,000	$527,000 - 552,500

EXHIBIT 2

LIST OF CONTACTS

VITA

Stephen Hirsch, Chief of Party
Stephen McGoff, Renewable Energy Technician
Donna C. Read, Desk Officer Africa Middle East Regional Operations
Lawrence Williams, Deputy Executive Director, Director, Africa Middle East Regional Operations
[Interviewed prior to start of evaluation:
Rob Fraser, Renewable Energy Technician
Jon Hodgkin, VITA Wind Specialist
Jesse Ribot, First Phase Assessment Economist
Matthew Milukas, Second Phase Assessment Economist
Shibu Dhar, Power Sector Analyst
Kevin Dwyer, Sociologist]

GOVERNMENT OF THE REPUBLIC OF DJIBOUTI

Office of the President

ISERST

Anis Abdallah Mohamed Kamra, Director of ISERST
Abdourahman Farah Hassan, Earth Sciences Specialist, VITA Counterpart Project Director (Homologue Chef de Projet)
Abdoulkarim Moussa Yacin, Earth Sciences Technician
Idriss Ismail, Earth Sciences Technician
Mme. Turkia, Information Systems Specialist
Nabil Zeid, Technician

Ministere de l'Industrie et du Developpement Industriel

M. le Ministre, Samki Ahmed El Haj

Service de l'Energie

Oblik Dibeth Carton, Chef du Service

Ministere de l'Agriculture et du Developpement Rural

Service de l'Agriculture et des Forets

Fouad Ismail, Comite pour le Developpement Rural (CIDR) Liaison

Genie Rural

M. Mairey, French Cooperant

Ministere du Commerce, du Transport et du Tourisme

Etablissement Public des Hydrocarbures

M. Pellfique

Ministere des Travaux Publics, des Affaires Urbaines et du Logement

Direction des Travaux Publics

Ahmed Ali Ahmed, Director, Housing and Urban Development Project

Direction de l'Urbanisme et du Logement

Ali Cheik, Director
Abdi Djaha, Directeur Adjoint

Electricite de Djibouti

M. Becquet, Director

Ali-Sabieh District

Khairah Allaleh, District Commissioner

USAID/DJIBOUTI

John Lundqren, Aid Affairs Officer
Ernest Popp, Deputy Aid Affairs Officer
Ismail (?), FSN

WORLD BANK

Michael Saporara

OTHER CONTACTS

Fonds d'Assistance et de Cooperation

M. Dominoni

Volontaires du Progres/Djibouti

Henri Gaston

Private Sector

Syad Mahmoud (waste-oil utilization, ceramic kilns)
Philco Representative (air conditioning)
M. Abaneh (Cinva-Ram brick fabrication and construction)
Chambre du Commerce
S. Coubeche
Etablissements S. Coubeche
Bernard Cinquin, Director General
Banque du Commerce et de l'Industrie Mer Rouge
M. Pfumio

EXHIBIT 3

LIST OF DOCUMENTS CONSULTED

1. Project Paper: "Energy Initiatives" (Project Number 603-0013, May 6, 1981)

2. Project Authorization, June 8, 1981

3. Action Memorandum: "Djibouti Energy Initiatives Project (603-0013), Nationality and Source/Origin Waiver for Procurement of Construction Services and Material" June 3, 1981

4. Action Memorandum: "Djibouti - Energy Initiatives Project (603-0013); Request for Vehicle Procurement Ssource/Origin Waver" June 8, 1981

5. Project Grant Agreement between The Republic of Djibouti and the United States of America for the Energy Initiatives Project, July 16, 1981

6. Side Agreement to Project Grant Agreement between The Republic of Djibouti and The United States of America for The Energy Initiatives Project, July 16, 1981

7. Annex 1: "Amplified Project Description"

8. Accord de Subvention de Projet Entre la Republique de Djibouti et les Etats-Unis d'Amerique Concernant le Projet: "Energie Renouvelable," July 16, 1981 (French version of the ProAg)

9. Annexe 1: "Description Elargie du Projet

10. Decret No. 78-046 "Portant organisation administrative et financiere de l'I.S.E.R.S.T." June 14, 1978 (Decree on the organization of ISERST, which was created by decree February 23, 1978)

11. ISERST: "L'Utilisation des Energies Renouvelables dans le Secteur Rural," 1978

12. IBRD: "Djibouti: Economic Memorandum," November, 1980.

13. IBRD: "Report and Recommendations of the President of the International Development Association to the Executive Director on a Proposed Credit to the Republic of Djibouti for a Technical Assistance Project," April 5, 1982

14. ISERST, Direction de la Planification: "Etude Techno-Economique de Prefaisabilite Geothermique - Conclusions Generales," April, 1982

15. PIO/T No. 600-0013-3-10003, May 15, 1982 (modifies Project Paper)

16. Cost Reimbursement Type Contract Number 600-0013-C-00-2001-00 between REDSO/EA and Volunteers in Technical Assistance, June 11, 1982

17. IBRD: "Projet de Developpement Urbain," June, 1982

18. Projet de Loi "relative a l'organisation du Ministere de l'Industrie et du Developpement Industriel" (date? post-June 5, 1982) (Law creating the Service de l'Energie as one of three services in the ministry)

19. UNDP: "Politique Energetique Nationale" by P. Rakotoburison, 1982

20. Amendment/Modification (no number), July 20, 1982 (amends funds obligated for VITA contract)

21. Letter from E. M. Amundson, AAO/Djibouti to Daher Djama Robleh, Director of Foreign Affairs, Ministry of Foreign Affairs and Cooperation, GROD, September 13, 1982 (reduces GROD obligation to DF 40,000,000)

22. Accord de Subvention de Projet entre la Republique de Djibouti et les Etats-Unis d'Amerique, Agissant par l'Agence pour le Developpement International ("A.I.D.) pour le Projet de l'Energie Renouvelable, Amendement No. 1, September 23, 1982 (increases GROD obligation to $1,345,000)

23. Amendment No. 2 ("Modification of Contract/Order No. 603-0013-C-00-2001-00 dated 6/22/82") November 9, 1982 (obligates additional $2 million for VITA contract)

24. United Nations: "Verbatim Report, Round Table, 23-26 February, 1981, Djibouti." UNDP, 1982

25. "Proposal for a Solar Pond for Djibouti," by Clarence Kooi, November, 1982

26. First Project Quarterly Report, January 9, 1983

27. Memorandum from Wes Fisher, Energy Advisor, REDSO/ESA to E.M. Amundson, AAO/Djibouti, W.E. Popp, General Development Officer/Djibouti, and Steve Hirsch, VITA-COP, March 8, 1983 "Djibouti Energy Initiatives (603-0013) - Work Plan Review"

28. Second Project Quarterly Report, April 4, 1983

29. Third Project Quarterly Report, July 5, 1983

30. "Building for the Maritime Desert - Climate, Construction, and Energy in Djibouti" by Daniel Du[illegible]am, August, 1983

31. Fourth Project Quarterly Report, October 11, 1983

32. Action Memorandum: "Request for a Waiver of Source Requirements for Procurement for the Djibouti Energy Initiatives Project, 603-0013" October 28, 1983]

33. Country Development Strategy Statement, FY 1986, Djibouti, January 1984

34. Fifth Project Quarterly Report, January 10, 1984

35. Memorandum from Lundgren, USAID/Djibouti to Laura K. McGhee, RCO, REDSO/ESA, January 27, 1984 "Djibouti - Energy Initiatives Project"

36. Sixth Project Quarterly Report, April 5, 1984

37. Amendment of Solicitation/Modification of Contract, Amendment No. 3, Modification of Contract/Order No. 603-0013-C-00-200-03, February 27, 1984 (changes level of effort according to attached memorandum from W.Ernest Popp, USAID/Djibouti to Steve Hirsch, VITA/Djibouti, dated April 10, 1984)

38. Memorandum from Tom(sic) Pryor, REDSO to John A. Lundgren, USAID/Djibouti, May 3, 1984 "Trip Report - Status of Energy Initiatives Project (603-0013)"

39. AID: "Housing and Urban Development in Djibouti," Project (603-0020), May 25, 1984

40. AID: "Housing and Urban Development in Djibouti," Project (603-0020), Draft Memorandum of Understanding, June 19,1984.

41. Memorandum from D. Michael Bess, Dep. Regional Director, EIA/ESA(Nairobi) to W. Ernest Popp, USAID/DJIBOUTI and C. Anthony Pryor, REDSO/ESA Energy Officer "Energy Initiatives in Djibouti Project (603-0013) Evaluation Recommendations....." June 23, 1984

42. FY 1986 Annual Budget Submission, June, 1984

43. Seventh Project Quarterly Report, July 16, 1984

44. "Reducing Energy Consumption in Buildings - The Potential for Conservation in Djibouti" by Seymour Jarmul, July, 1984

45. Djibouti Energy Initiatives National Energy Assessment, September, 1984

46. Miscellaneous documents pertaining to the IBRD HUD project:
    Draft cable, USAID/D to Nairobi, September 11, 1984
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    Memo to Jon Lundgren from Steve Hirsch, November 7, 1984
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47. Cable, USAID/Djibouti to Nairobi, September 25, 1984 (re: Touzet contract)

48. Eighth Project Quarterly Report, October 16, 1984

49. Memorandum from W. Ernest Popp, USAID/Djibouti to Steve Hirsch, VITA/Djibouti, October 25, 1984, "Hirsch-Popp Memo Dated 10/24/84" (re: Touzet sub-contracts)

50. Memorandum from Steve Hirsch, ISERS1/VITA to Jon Lundgren, USAID/Djibouti, November 12, 1984, "Future Project Prototype Activities"

51. Djibouti Energy Initiatives Training Plan, November, 1984

52. Cable, USAID/Djibouti to Nairobi, November 11, 1984 (re: Touzet contract)

53. Cable, USAID/Djibouti to Khartoum, November 15, 1984 (re: Touzet contract);

54. Cable, USAID/Djibouti to Nairobi, November 15, 1984 (re: Touzet contract)

55. Programme d'Action Commune Entre le Genie Rural et l'ISERST/VITA pour la Campagne: "Reparations et Installations des Eoliennes dan le Nord du Pays," December 5, 1984.

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57. Memorandum from John A. Lundgren, AID Representative USAID/Djibouti to Steve Hirsch, Resident Manager VITA/Djibouti, "Settlement of Touzet Sub-Contracts on ISERST Energy Sciences Building (Energy Initiatives Project (603-0013))"

58. Project Implementation Letters 1-12

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