

BIBLIOGRAPHIC DATA SHEET

1. CONTROL NUMBER
PN-AAH-6292. SUBJECT CLASSIFICATION (695)
APOO-0000-G240

3. TITLE AND SUBTITLE (240)

Tunisia energy study: a cooperative program in alternative energy resources and technologies

4. PERSONAL AUTHORS (100)

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5. CORPORATE AUTHORS (101)

Development Sciences, Inc.

6. DOCUMENT DATE (110)

1978

7. NUMBER OF PAGES (120)

25p.

8. ARC NUMBER (170)

TS333.7.G661

9. REFERENCE ORGANIZATION (130)

Dev. Sciences

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Cooperation	Alternative energy
Tunisia	Resources
Energy needs	
Program planning	
Natural resources	

13. PROJECT NUMBER (150)

298003500

14. CONTRACT NO.(140)

AID/DSAN-C-0059

15. CONTRACT
TYPE (140)

16. TYPE OF DOCUMENT (160)

TS
333.7
G661

(DS 084)

TUNISIA ENERGY STUDY:
A COOPERATIVE PROGRAM IN ALTERNATIVE
ENERGY RESOURCES AND TECHNOLOGIES

October 24, 1978

Prepared For

Office of Energy
Bureau for Development Support
Agency for International Development
Washington, DC 20523

Prepared by:

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1. INTRODUCTION

The following report is divided into four parts. The Introduction defines the context of the effort. The Interpretive Summary presents the major considerations that are part of the study team's findings garnered from more than fifteen appointments with Tunisian Government officials and private sector representatives. (List of visits and participants can be found in the Appendix). The Conclusions provide criteria and a general evaluation of the opportunity in Tunisia to cooperate in the energy field. The Recommendations translate these conclusions into specific steps that can be taken to launch a cooperative effort.

The US Energy Study Team visiting Tunisia was lead by Dr. Morton Gorden, an Energy Institutional and Planning Specialist, and included Dr. James D. Westfield, a Conventional and Renewable Energy Technology Specialist. Both are senior employees of Development Sciences Inc., a contractor to USAID. This team worked in Tunisia between 9 and 21 October 1978. The Team's terms of reference required a review of pertinent energy and economic development plans, an examination of energy institutions and institutional development, discussions with AID, Tunisian government and private sector representatives, and recommendations to USAID Tunis, the Tunisian government, and Washington of activities that will, within budgetary limitations, support the advancement of renewable and fossil resource energy for national development. This report is a summary of the findings and is prepared particularly for USAID personnel familiar with Tunisia.

It contains summaries of the evidence collected, conclusions and recommendations. The evidence upon which the conclusions and recommendations are built is not included. The purpose of this report is to present recom-

mendations and to show how they were developed. Tunisian reports, meeting summaries, and other pieces of evidence are referenced in the Appendix.

2. INTERPRETIVE SUMMARY OF VISITS

The details of interviews and meetings can be found in the Appendix. In this section we condense the experience into four broad categories. First, we will report on the level of consciousness of energy issues in terms of a willingness to act. Then, the discussion turns from that willingness to the planning activities to guide action. Financing action then becomes the content of the next set of issues. Lastly, we turn to the ability to translate the ideas and mobilize the resources in organizing action. While much of the discussion will be in the style of reporting rather than evaluating, team judgments will also be included on occasion.

Willingness to Act

While there is clearly a spectrum of consciousness in Tunisia which ranges from excitement about energy issues to lack of awareness, the level of interest in pursuing a course of action among the people we met was extraordinarily high.

Everyone wants some form of alternative energy especially solar and wind applied to their areas of responsibility. In a number of meetings we found specific knowledge of a specific technology or an application and in a few instances this knowledge and understanding had been carried as far as need and market studies¹ or research plans². Whether we talked to people in charge of public building construction, education, agriculture

or other activities, we found ready audiences and people who worked well and forcefully in groups to help define alternative energy applications. Of course, we met with a high, though not the highest level, of government and public sector personnel assembled for the purpose of discussing energy. The willingness to communicate and formulate ideas was indeed impressive. We were particularly impressed with the willingness of different groups within and among ministries to work with each other, a rare occurrence in many developing countries.

The willingness to act was also displayed in the quick response to assemble data and in the very existence of substantial data sets already processed and analyzed for energy issues. There the data was often not organized in a form suitable for specific work, such as energy technology or site selection; however, the people in charge of groundwater information, meteorological data, or agricultural production statistics were anxious and able to change data collecting protocols wherever needed.

In sum, we found a fertile field of interest and great enthusiasm to proceed with AID, international organizations, other countries, and alone. There is much momentum and there are people in charge to maintain it.

Planning

To direct the enthusiasm in fruitful channels, there is a planning mechanism in place. For traditional fossil fuels, the planning data and analysis for supply and demand by sector is excellent.³ However, for alternative sources such as geothermal, lignite, and solar, wind, and biomass, the planning efforts are far from being in place. Early efforts are being undertaken within different ministries but the Five-Year Plan, 1977

to 1981⁴ is silent on alternative forms of energy. A national energy plan is underway and will correct this situation, but at the moment a well defined set of goals and a policy for alternative energy sources has not been formally defined and accepted.

Mr. Boussoffara, the Cabinet Chief for the Energy Minister, recently back from a Conference at Malta, has articulated a national goal of 10% reliance on renewable energy by 2020. The goal arises from the example of Israel and Cyprus and enthusiasm for moving forward. A great deal more work needs to be done to convert this goal into a planning format which will result in implementation. People now have the assignments to do this.

There are two pieces of the energy planning process which we did not find particularly convincing. At the micro level, we did not find that energy budgeting was being done so that project level decisions could be made in the context of the use of different forms and amounts of energy. Energy budgets appear only as line item fuel costs in fiscal budgets.

At the macro level, we found very conscious decisions being made about the best use of oil or natural gas; about the best use of land to grow crops rather than wood for biogas or combustion; about the best use of agricultural waste for compost or fertilizer rather than energy. However, the responses to questioning were given more in the context of a traditional concern for improving soils in a country where soils are poor rather than in the context of a trade off among competing uses of a resource. While this conclusion may in fact be correct, the most productive use of resources discussions were of lesser analytical quality than is needed to convince the team, and indeed, some important Tunisians who do not share the viewpoint of managers of the agricultural sector.

In sum, with some important exceptions, the planning activity is substantial, of high quality, and raises appropriate issues for political decisions. There is effort to correct the deficiency in alternative energy planning and within one or two years, the existing capability should grow. In fact, there is so much planning in general, that people are tired of studies and show an impatience to act. The team recognizes the planning deficiencies, but, as will be dealt with in the conclusions, willingly followed the discussions as they moved away from studies toward plans for action.

Financing

In many interviews, the subject of cost of alternative technologies was raised. The difference between subscribing to monthly electricity payments and buying solar heaters and the difference between a farmer's cost of diesel or electric pumping and a solar installation was recognized. Furthermore, it was clear that current domestic energy prices which are approximately four times cheaper than the export price of energy are responsible for cost discrepancies between fossil and future energies.⁵

In selected areas, it appears that two important changes are being made. First, the government is getting ready to raise the price of some fuels. Second, there is serious programmatic discussion of subsidizing solar energy to the same level as fossil in order to assist the introduction of technologies. Immediate plans are to apply support to solar water heating. This should be accomplished in two to three months.

The banking institution and governmental regulations and procedures

establishing financial incentives for business⁶ are very favorable to the development of new industries. There is already in place a financial mechanism ideally suited for stimulating an alternative energy technology manufacturing industry.

In sum, people distinguished between the social or national cost of energy and the marketplace cost and are prepared to make some adjustments. There are limits to the changes that can be made to energy prices so that alternative mechanisms to finance and support solar applications will be designed. Already the talk about allowing the use of foreign exchange for buying solar equipment and for encouraging domestic industry has gone to significant levels of detail.

Translation to Action

In terms of the availability of alternative energy resources, the supply is excellent. There is much sun, wind, municipal waste and some material for biogas. The geothermal and lignite resources are unknown in quantity, quality or cost of development, but are under investigation. New gas reserves have been found and oil remains as an export earner of major significance. A coastal and offshore border dispute with Libya, if settled, might open up still more hydrocarbon potential. The government is now acting, however, on the assumption that its oil imports will exceed exports by 1990.

On a few occasions we met opinions that nuclear power, even with breeder reactors, would make up the gap. Nuclear waste disposal in the oceans or the Sahara was deemed feasible and uranium could be extracted from local phosphate ores. Research work is now underway into extraction of uranium from these and other ores.

In terms of the energy technologies used to exploit these resources there was a great variation of knowledge. Except for some interest in solar electric generators, most people discussed the resources in terms of past technologies. Wind, for example, has a long tradition in Tunisia, but when a group that constructed and maintained windmills left the country, they fell into disuse. Knowledge of today's wind machines is not expansive. This is true of lignite combustion technology as well as biomass use. The full potential of the new technologies for the old sources is not well understood.

To go toward action with the sources and technologies for their exploitation also requires institutional capacity to manage the effort. There is now a Ministry and bureaucratic structure and personnel to manage the energy effort. The people in charge are experienced and well trained but not in alternative energy forms; they have responsibilities and opportunities which under the right circumstances imply future capabilities.

In the private sector a commercial solar hot water heating system is available and has been installed in a few locations but it has many problems. In agriculture solar pumping is being tested and in education, alternative energy technologies research is underway.

In sum, Tunisian resources are ample in sun and wind such that efforts in this area can result in substantial energy production. Knowledge of appropriate technologies, however, is limited and often not abreast of current state of the art. Institutional forms are in place, but there are few real alternative energy experts to make informed decisions. The translation to action therefore requires additional attention to be discussed in the conclusions.

This interpretive summary of the interviews can be augmented by records of meetings and by the data and analyses contained in the references. It leads to conclusions regarding each of the major categories of reporting.

3. CONCLUSIONS

The conclusions and later recommendations in this report are based on assumptions and expectations of the visiting team. The basic conclusion presented below is enthusiastically in favor of continued relations between the two countries in energy activities. This is because the team assesses that Turisia has satisfied or is able to satisfy a sufficient number of criteria for successful energy programming. Where criteria are not met, we expect that the deficiencies are correctable by ongoing program activities and the stimulus of ongoing event.

Future program design is sensitive to the level at which the country performs on these criteria. The team findings are presented in terms of four basic preconditions for successful energy programming.

First, the team found a sufficient level of consciousness and information about liquid fuel reserves and the potential contribution of alternative energy sources to provide an attitudinal base favorable to continued effort.

Second, in planning for energy futures we found evidence of technical knowledge that would contribute to good decisions regarding where and for what uses a variety of energy technologies are suitable. Such information does not yet extend to a knowledge of trade offs among alternative sources and technologies.

Third, there was an awareness of financial issues. This is required

because most, if not all, alternatives to liquid hydrocarbons are more expensive at least in initial capital costs.

There is a history of making financial manipulations and then finding that they provided an insufficient tool to assure priority usage of remaining fossil fuels and other sources. Consideration will have to be given to programs to assure appropriate uses of different resources. Regardless of current domestic market costs of oil and gas recovery, the use of liquid fuels may soon be restricted for generating electric power. Additional resource trade offs will have to occur and should be encouraged in areas such as the use of organic wastes for composting and use for soil amendment and fertilizer as opposed to heat value in combustion.

Fourth, the team found the beginnings of an ability to manage the energy programs to bring them to implementation. The management requirement includes both institutional structure and human resources to conceive of a program and bring resources to bear on its accomplishment.

The following conclusions give more detail to the above general findings.

1. The team concludes that the level of consciousness and information is quite sufficient to support substantial effort in renewable energy technologies applications. The Tunisians are aware of a number of potential applications especially in agriculture for pumping water^{7,8} and in buildings for heating water.

2. While the planning for renewable energy use is not at a level needed for ultimate national planning, sufficient work has been done to warrant moving to action at this time. Any studies to be done at this time should be done with a project orientation for implementation.

3. The government is progressing rapidly in its understanding of subsidies and financial requirements to encourage renewable energy. Future work between the two countries has a greater chance of succeeding in later commercialization due to the government willingness to deal with the discrepancy between fossil and other energy sources.

4. Institutional forms have been developed that can serve to accomplish the ends of the two countries. The Tunisians have people in visible locations to be able to deal with decisions to be taken. The USAID Mission is in good contact with those people and through both its Science and Technology Program⁹ and its Central Tunisian Program¹⁰ it can and wishes to coordinate funds and activities to further application of energy to economic development programs.

5. The basic preconditions for success are therefore met and activities which focus on action should be encouraged. Specific activities are suggested in the recommendations.

6. The major weakness in meeting the criteria applied lay in a lack of familiarity with the range of technologies of renewable energy. Training in those technologies through both "hands on" and some formal presentation is needed. At the same time, actual applications, especially in agriculture, will provide the necessary field experience to move the training from early familiarization to the more advanced level gained from actual experience. Action and training can proceed simultaneously.

7. The AID target population of the truly disadvantaged can be served directly with rural and agricultural programs and applications destined for the rural poor. Indirect benefits come also in programs designed to provide

general electricity capacity or limit urban use for Tunisia has a substantial rural electrification program in place. Tunisia is also of interest for its demonstration effect on other Francophone African and Arabic countries. Its mix of densely populated coast and remote arid regions provides a full range of demographic and geographic opportunities.

4. RECOMMENDATIONS

Near the end of the visit at a meeting of the National Commission on Solar Energy attended by the team and a wide range of Tunisians, a list of Tunisian alternative energy assistance needs was developed. The focus of this needs list was not only solar for it included wind, biomass, and others. However, it was exclusively directed towards needs in alternative energy and did not cover traditional energy resources. While there are needs for assistance in the traditional energy field, the area is far advanced into implementation and some of the needs/desires are not in line with US policy. The needs identified in the alternative energy field were many and included requests for scholarships, training, technologies and even capital in several geographic and economic sectors. The list of requests was not prioritized but it was comprehensive and contained both short and long-term items. A Form of Prioritization was evident, however, in that certain areas and types of assistance which could have been justified were not included.

This Tunisian summarization, the advice from the AID mission and State Department personnel¹¹ involved in this visit and the team's conclusions have been used to structure a five-part process of AID-Tunisian alternative energy cooperation. Emphasis has been placed on the next step in each part, but each recommendation includes a discussion of possible outcomes and following steps. The following recommendations will be developed in more detail following evaluation by and consultation with AID personnel in Washington, D.C. At this time, lacking this final project input, the recommendations are presented in a general form.

Recommendation 1

The first recommendation is related to assisting the Tunisians in alternative energy technology-applications training. Conclusion 6 identified the need for training in and experience with alternative energy technologies. In order to build a broad understanding of technologies and their applications a program of training, education and experience is required. The first step in this process should be a six-day-in-country seminar for 50 Tunisians. This seminar should be divided into two sessions and stress several alternative energy technologies such as solar photovoltaic, solar thermal, wind, biogas, etc. It is also critical to the success of this and following steps that experience with operating equipment be an integral part of the training. One session of the training would involve theory and equipment familiarization and the second session would involve demonstrations of selected technologies. At the end of this training, there will be significant progress towards creating a base of Tunisian alternative energy technologists. The next step in this part of the cooperative process could involve selecting candidates for further US based training in applications at universities and in industrial/private sector residencies.

The initiation of this recommendation will require a small training design phase; staffing and preparation and in-Tunisia training. The design should start immediately, and should take two weeks. The staffing and preparation should take two months and the total first step should be completed by March 1977. A total estimated budget of \$60-80,000 US should be set aside for this step. It is assumed that equipment would not be

purchased outright for this training. Examples of solar, wind and other technology equipment could be borrowed from government agencies, educational institutions or supplied on loan by instructors/participants. It is anticipated that this type of training could be valuable in other developing countries and if it is repeated elsewhere the cost per seminar would be less.

Recommendation 2

The second recommended part of the process of cooperation is related to the Tunisian desire, need, and readiness to link alternative energy technologies to economic development. In the municipal sector with solar hot water heating, they are already well on their way. In the agricultural sector, the first three preconditions have been met and some technology testing/demonstration is already underway. It is recommended that as the first step in this process the US participate with the Ministry of Agriculture in the design of a project to use alternative energy technologies in rural agricultural settings.

Ideally, the US contribution to the design team should be composed of one overall alternative energy technologist who is capable of making resource use/technology tradeoff analyses and two technology specialists who among them know about solar, wind and biogas applications in rural and agricultural settings. Based on the outcome of this project design step, continuing cooperation in other implementation steps can be established. The second step would involve equipment acquisition, installation and startup and a third step would involve use of the technologies to accomplish

irrigation and the delivery of mechanical/electrical energy to selected other rural needs such as health care, crop drying and communications.

The Tunisians are able and ready to immediately start the project design, and it should be completed as soon as is possible to run concurrently with their planning of their central Tunisian project. The design phase can be accomplished in one month. The design phase should be completed by April 1979 and the cost for US participation in this first step should not exceed \$30,000-\$40,000.

Recommendation 3

In the longer term, the Tunisians are searching for ways to supplement current fossil and hydrobased power generation. Their major emphasis seems to be nuclear; however, they also consider central solar electric power as a possible contributor. In order to begin to build understanding of the potential for this technology, we recommend the provision of a US specialist in central solar electricity generation in Tunisia for two weeks. The specialist as a first step could work with the National Engineering University (ENIT) and the National Electricity Company (STEG) to plan a long-term program of research, planning, testing, and implementation. This first step would inform the Tunisians as to the state-of-the-art and expectations for progress and define the next step in technology examination i.e. research in power conditioning, testing of concentrators and solar thermal devices, visits and training in the US. At the completion of this first step, cooperative activities can be agreed upon. The Tunisian's are ready for this step now and \$10,000-\$15,000 should be set aside for financing the visit of a US specialist.

Recommendation 4

The newly created Ministry of Industry, Mining and Energy (IME) is and will be the place where alternative energy planning is done and where energy resource allocation decisions are made. This activity will have a wide range of impacts on other ministries and on other resources. It is important to develop in this ministry the understanding of and capacity to perform alternative energy resource tradeoff studies. This is especially true for some of the energy resources such as garbage, agricultural waste, and manure, which can be combusted to produce steam, digested to produce biogas or through composting used as the basis for soil supplements and fertilizers. In order to assist the ministry in developing this capacity, we recommend that AID help the Ministry (IME) design and initiate a study of alternative uses of organic materials. As an example, the study can use the problem of Tunis' municipal waste and evaluate whether combustion, composting, new disposal sites or some combination is to be recommended. This assistance may only involve this one step or it might expand to helping build other analysis and evaluation capabilities. The assistance would focus on help in starting the study and on working through calculations in life cycle costing, identifying the type and amounts of data necessary, development of protocols for comparing social, environmental, economic and energy implications, etc.

This US assistance should be two US experts who, between them, know about municipal waste and biomass composting, municipal waste combustion and disposal, and resource use tradeoff analyses. This study assistance

can be started immediately, should be budgeted at \$10,000-\$15,000 US, should take two weeks, and in the team's opinion, is one of the most critical pieces of the recommended package. It is important because it helps the Ministry sustain their momentum in alternative energy planning, it shows US interest and willingness to continue the excellent cooperation in the alternative energy field, and rapid initiation of this assistance will allow time for implementing other recommendations.

Recommendation 5

Throughout the visit we found Italian, French, German, Swiss and other countries' equipment and consulting capability mentioned in the field of alternative energy technology. This is reasonable in terms of the history of other countries' commercial involvement in Tunisia. However, in that the first three preconditions for application seem to be met, that application is starting and that much of the equipment must be imported, it is an excellent time to find ways to introduce US technologies. In other recommendations, this introduction is accomplished in small ways; however, to most efficiently introduce US alternative energy technologies to Tunisia and Tunisia to US businessmen, we recommend a US Trade Mission or Technical Sales Seminar organized around alternative energy technologies. The planning and arrangements for this are longer term than the other projects, and it is possible that this mission could be arranged as a part of or in conjunction with an International Trade Fair to be held in Tunisia tentatively planned for 1980. No funding or other timing estimates can be made

at this time for this recommendation; however, we feel planning for this should begin in the US as soon as is possible.

OVERALL TIMING AND FUNDING

The timing for the first steps is phased so that all but Recommendation V should be completed by no later than April, 1979. This completion date will allow both the US (fiscal year starts October, 1979) and the Tunisians (fiscal year starts January 1980) to make timely decisions on how to budget step two follow-ons. The first steps in this package of five recommendations should be funded out of fiscal year 1979 monies.

This is a package of recommendations and while the team members have individual preferences, we do not wish to prioritize among the five, except by suggested timing and funding levels for each. The cost estimates for each recommendation are very low and reflect our estimate of the minimum level of expenditure necessary to accomplish the goals of each recommendation.

These recommendations represent phase one of each project. For example, when the agricultural project design phase is completed implementation, startup and operation could easily cost more than one million dollars. When the in-country 6-day training seminar is completed and the Tunisians have a better basis on which to specify training priorities, a US education and US or Tunisian residency program can be established. Additionally, should the preliminary biomass (municipal waste) tradeoff study in Tunis advance the proficiency of alternative energy/resource/technology planning, then implementation will be possible.

APPENDIX A

REFERENCES

1. Les Perspectives d'Utilisation de l'Energie Solaire en Tunisie - Le Chauffage Domestique. Entreprise Tunisienne d'Activités Pétrolières, Octobre 1978.
2. École Nationale d'Ingenieurs de Tunis Solar Energy Research Lab and Program.
3. An Analysis of Fossil Fuel Use in Tunisia in 1974, Entreprise Tunisienne des Activités Pétrolières (ETAP), Octobre 1978.
4. V Plan de Développement Économique et Social 1977-1981 République Tunisienne.
5. An Analysis of the V Plan 1977-1981 of the Tunisian Government prepared by a World Bank Team in 1977.
6. Régime Particulier En Faveur des Industries Exportatrices and Loi 74-74 du 3 Août 1974 Relative aux Investissements dan les Industries Manufacturieres. Agence de Promotion des Investissements Publications.
7. Letter from the Minister of Agriculture to the Minister of Industry Mines and Energy 17 October 1978.
8. Les Projets de Recherche sur l'Energie Solaire Proposes par le Centre de Recherche du Genie Rural - Tunisie, Centre de Recherche du Genie Rural 1977.
9. USAID Mission Tunis, Science and Technology Program 1977.
10. Draft Concept Paper on Central Tunisia Rural Development, USAID Tunisia 1978.
11. Mr. Herman Marshall, Assistant Director, AID Mission.
Mr. Charles R. Sadler, Economic & Social Councillor, AID Mission.
Mr. W. W. Williams, Science & Technology Advisor, AID Mission.
Mr. Zarg El Agoun, Senior Tunisian Employee, AID Mission.
Mrs. Chelbi, Assistant to Science & Technology Advisor, AID Mission.
Mr. Harry Montgomery, US Embassy, Economic Councillor.

APPENDIX B

A LIST IDENTIFYING PARTICIPANTS AT MOST OF THE MEETINGS
HELD BY THE AID ENERGY TEAM WHILE IN TUNISIA

Partial
List of Participants from GOT

Wednesday October 11, 1978

Ministry of Industry, Mines, and Energy , were present:

Mr. Khlifa Karoui : Director of Energy

Mr. Youssef Bahri : Coordinator, Ministry of Industry, Mines, and Energy

Ministry of Equipment , were present:

Mr. Abdelhamid Fekih: Director of Building - Min. of Equipment

Mr. Youssef Bahri : Ministry of Industry, Mines, and Energy

Thursday October 12, 1978

Ecole Nationale d'Ingénieurs de Tunis (ENIT)

Mr. Ahmed Marrakchi : Director of ENIT

Friday October 13, 1978

Ministry of Agriculture

Mr. Youssef Bahri: Min. of Industry, Mines, and Energy

Mr. Mohsen Hamza : Directeur des Sols - Min. of Agriculture

Mr. Malek Ben Salah : Directeur de la Production Végétale

Mr. Jameleddine Saadallah: Adjoint du Directeur des Forêts

Mr. Jaoua : Genie Rurale

Mr. Netij Ben Mechlia: Institut National de Recherches Agricoles de Tunisie

Mme Benzarti : Institut National de Recherches Agricoles de Tunisie (INRAT)

Mr. Amor Guellali : Genie Rural , Centre des Recherches.

Saturday October 14, 1978

Ministry of Education

Mr. Zouari

Mr. Maalej

Mr. Ali Hili

Mr. Ahmed Bouraoui

Mr. Ezzedine Makhlouf

Mr. Ahmed Marrakchi: Director of ENIT

Mr. Mahjoub : Directeur de l'Enseignement Supérieur

Monday October 16, 1978

Mr. Hassen Boussofara : Chef de Cabinet, Min. of Industry, Mines, & Energy

Mr. Youssef Bahri : Min. of Industry, Mines, & Energy

Institut National de Meteorologie:

Mr. Taoufik Kechrid : Directeur de l'I.N.M.

Mr. Guettari : Sous-directeur

Mr. Allouch

Mr. Trabelsi

Mr. Kassar : Ingénieur Principal

S.T.E.G. ; Société Tunisienne de l'Electricité et du Gaz

Mr. Taoufik Skandrani

Mr. Limam Abdelmajid : Chef de Departement Transmission, STEG

Mme Bourogaa Zoubeida : Chef de Departement Distribution et Equipement

Tuesday October 17, 1978

Entreprise Tunisienne d'Activités Petrolières "ETAP"

Mr. Belgacem Mezni : Directeur des Etudes, Eng. et Develop. "ETAP"

Mr. Alaya : Ingenieur

ANNASOL:

Mme Annabi

Mr. Youssef Bahri : Min. Industry, Mines, & Energy

Wednesday October 18, 1978

Commission Nationale de l'Energie Solaire:

Mr. Hassen Boussoffara : Chef de Cabinet, Min. of Industry

Mr. Abdelkefi : Commandant, Min. de la Defense

Mr. Mohamed Khaled : Min. des Affaires Sociales

Mme. Annabi : ANNASOL

Mr. Belgacem Mezni : ETAP

Mlle Kraiem : STEG

Mr. Salah Souki : STEG

Mr. Ahmed Marrakchi : ENIT

Mr. Ezzedine Makhlouf : Sous-directeur, Enseignement Supérieur

Mr. Fethi Gana : Ministère de l'Equipement

Mr. Malek Ben Salah : Ministère de l'Agriculture

Agence de Promotion des Investissement "API" :

Mr. Abderrahman Bacha : Directeur des Etudes et du Suivi.

Centre de Recherches Genie Rural "CRGR"

Mr. Ammami: Directeur du Centre.