Unclassified
CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) — PART I

Report Symbol U-447

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
Energy Policy Development and Conservation (Morocco Sub-Project)	936-5728	S&T/EY

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY)

☒ REGULAR EVALUATION ☐ SPECIAL EVALUATION

5. KEY PROJECT IMPLEMENTATION DATES	6. ESTIMATED PROJECT FUNDING	7. PERIOD COVERED BY EVALUATION
A. First PRO-AG or Equivalent FY 80	A. Total $	From (month/yr.) 12/80
B. Final Obligation Expected FY 84	B. U.S. $	To (month/yr.) 4/83
C. Final Input Delivery FY 84		Date of Evaluation Review 5/2 5/13

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
S&T/EY and Mission have agreed to jointly extend funding for one additional year to ensure continuity of energy planning TA to Ministry of Energy and Mines until Mission's follow-on project is authorized and contractor is in field. SOW for this transitional year will reflect evaluation team's recommendations re pricing and demand analysis, data base improvements, and enhancement of the capabilities of the EnVest model. An analysis of agricultural energy use and potential for fuel substitution in agriculture will also be included.	S&T/EY - P. Baldwin; NE/TECH - J. Bever; USAID/M- G. Bricker	USAID/M funding- 4th quarter FY 83 ($200,000) S&T/EY funding- 1st quarter FY 84 ($200,000)

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- ☐ Project Paper
- ☐ Financial Plan
- ☐ Logical Framework
- ☒ Project Agreement
- ☐ Implementation Plan e.g., CPI Network
- ☒ PIO/T
- ☐ PIO/C
- ☐ PIO/P
- ☐ Other (Specify) _____
- ☐ Other (Specify) _____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. ☐ Continue Project Without Change
- B. ☐ Change Project Design and/or
  ☒ Change Implementation Plan
- C. ☐ Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

S&T/EY, Pamela Baldwin

12. Mission/AID/W Office Director Approval

Signature: Alan B. Jacobs

Typed Name: Alan B. Jacobs

Date: June 14, 1983

AID 1330-15 (3-78)

United States Agency for International Development
Office of Energy

EVALUATION OF THE SUB-PROJECT FOR TECHNICAL ASSISTANCE TO THE GOVERNMENT OF MOROCCO ON ENERGY PLANNING AND POLICY DEVELOPMENT

Project Numbers 936-5703 and 936-5728

by

Daniel F. Kohler

John Peschon

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I. INTRODUCTION

In August 1980, AID and the Government of Morocco signed a Project Grant Agreement under which the parties agreed to undertake a collaborative effort in the area of energy analysis and planning. The activity was to be funded by AID/Washington's Office of Energy as a sub-project of the Energy Policy and Planning Project (936-5703). At the time of this evaluation the project is in its second extention which is expected to last until the end of this calendar year.

The original project agreement (See Ref. 8) called mainly for an economic analysis of the energy sector and its relationship to the national development plan. Institution building and training were important components.

The project was extended, the funds were nearly doubled, and a new statement of work (See Ref. 9) was developed. In this new statement of work, one important task became the "development of a decision-making model" and the acquisition of a micro-computer for the energy directorate in the ministry of energy and mines (MEM).

The project was further extended, the funds were again increased, the contractor (E^3I) and the subcontractor (DSI) were interchanged, and another statement of work (Ref. 10) was developed. The project also acquired a new identification number (936-5728).

On May 1, 1983, an evaluation team consisting of an energy economist, a power engineer and a microcomputer specialist arrived in Morocco for two weeks to conduct an evaluation of the project. We, the evaluation team, were asked not only to review whether the contractual

obligations and the project goals had been met, but also whether and how the project could be renewed, possibly with a change in funding source.

We base this evaluation on the available documentation of the project and a number of interviews with individuals familiar with the project. Besides USAID and contractor personnel we also talked to people in or near executive positions in the following GOM institutions:

Ministry of Energy and Mines:

Directorate of Energy

National Petroleum Products Company (SNPP)

National Coal Mining Company (CDM)

National Coal Marketing Company (SOCOCHARBO)

Royal Moroccan Petroleum Company (SCP)

National Electricity Authority (ONE)

National Office for Petroleum Exploration and Development (ONAREP)

Ministry of Industry:

Directorate of Industry

In order to encourage candor, we agreed not to name any individual by name or to attribute specific comments to specific institutions.

Part of our scope of work consisted of a number of specific questions. In Section III of this evaluation report we give the answers in the order given. The answers are based on an exhaustive study of the printed material available on the project, as well as on a series of interviews with GOM and USAID/Morocco personnel familiar with the project.

We were explicitly instructed to interpret our terms of reference

broadly and make any recommendations and comments that seemed relevant. In Secton II we do so after summarizing what we feel are the key findings based on the detailed answers to the questions in Section III. As such Section II represents the core of this evaluation report and can also serve as an executive summary.

A first draft of this evaluation report has been presented to USAID/Morocco. the project officer in S&T. as well as the prime contractor. Their comments have been taken into account in this final report. The contractor's response to our first draft is reproduced in the Appendix.

II. KEY FINDINGS AND RECOMMENDATIONS

On the basis of the documentation that was available and on the evidence collected during our evaluation mission. we have arrived at the following key findings:

1. There exists an undeniable need for improved planning and policy analysis capabilities within MEM. The methodologies that this project tries to introduce will eventually help reorient energy policy making toward better informed decisions. But the full changes sought take time. and we have not yet been able to detect any definite evidence of "policy" changes. Nevertheless, the project is being taken seriously by the Director of Energy and the Minister of MEM and it has their support.

2. The EnVest model constitutes the main output of the AID original project and its two extensions. EnVest is based on practical principles and should prove to be quite useful to MEM.

3. The achieved project goals and capabilities of EnVest fall substantially short of what had been set out in the original Project Agreement and the two extensions. Nevertheless. the contractors and MEM performance was very good, achieving most of what could reasonably have been

expected. The shortfall relative to the Project Agreement is essentially due to unreasonable expectations at the design stage, given resources available to the project, and not due to shortcomings in project management and execution.

4. One important task of the original project was to collect data pertaining to energy consumption, production and conversion. Reliable and current energy information was not readily available then and is not today. However, the EnVest model, the microcomputer and the Cellule de Planification could be used as a basis to collect and disseminate this data. Officials from several parastatals will support this Cellule as a mechanism for obtaining accurate strategic energy data and, if asked, will provide the Cellule with trained "informaticiens".

5. The development of programs for the Apple II microcomputer has been a major effort of the three projects funded to date. We are concerned about this for two reasons, namely:

- Software, such as VisiCalc, is available and costs only several hundred dollars. Off-the-shelf software can greatly reduce the programming effort and make it much easier for the Moroccans to assume EnVest-type

work and manage the energy database.

- The resident contractor should spend relatively less time programming with a microcomputer and more time assisting in the formulation of energy policy at MEM.

6. The April 1983 presentation of EnVest to officials of other Ministries and of the sous-tutelles was well-received. Some officials that we interviewed felt that the model was not clearly explained either before that meeting or since (it remained a "Black Box").

7. The project was intended to be a cooperative effor between the contractor and the GOM, mainly MEM. At this time. there are three Moroccan professionals assigned to the project on a full-time basis. Within MEM, a new "Cellule de planification" is under consideration; this section is intended to become the home of EnVest and its associated data base. However. at present the Moroccan professionals assigned to the project lack the identification with a permanent office and the status that such an association brings . This may cause them to view their job as temporary and insecure. increasing the likelihood that they leave.

Our conclusions and recommendations based on these findings are:

1. There exists a unique opportunity to introduce a new method of policy analysis and new analytical tools to a very receptive audience, i.e., the Director of Energy, his deputy and the Minister of Energy and Mines. These gentlemen are already talking about introducing this policy analysis methodology in other areas. a step which might be a little premature at this time, but is nevertheless a sign of the great interest at MEM in the new tool.

2. If USAID is willing to support and foster this process it must adopt a long time horizon (5 years or more) and be satisfied with slow and incremental progress.

3. AID can be effective if it works closely with the respective Moroccan policy makers. The aid in this area should be in the form of technical assistance to the proposed "Cellule de Planification" attached to the directorate of Energy. This technical assistance might take the form of partial staffing of the cellule, short-term advisory services and loans of equipment and software.

4. In order to conduct policy analysis and planning, the

"Cellule" would have to rely primarily on the EnVest II model. We feel that the link to EnVest I should be deemphasized. EnVest I should be developed primarily into a project evaluation and appraisal tool. This requires a few changes which are elaborated in our answer to Question B.3 (see Section III). EnVest II should be developed further, paying particular attention to the demand side of the energy balance. The pricing model that has been requested by MEM is absolutely essential in this context.

5. Now that the EnVest model is entering its operational phase, it is important that the database be maintained on a regular basis. To do this, we recommend that in the proposed "Cellule de Planification" a database manager be designated who maintains contact with the parastatals to acquire new data as it becomes available. Most parastatals that we talked to expressed a readiness to share their information, if in exchange they can also obtain some access to the EnVest models.

6. The training component of any follow-on project should concentrate on the training of policy analysts within MEM. This requires individuals with a background in economics, business, operations research and engineering rather than computer programmers. Consideration should be given to minimizing the programming chores through the use of high

level software packages and/or subcontracting with Moroccan software firms.[1]

7. The detailed staffing of the proposed "Cellule de Planification" will depend on the role that MEM assigns to it. We feel that it should include at least one experienced policy analyst with a Ph.D. in economics or equivalent experience, an engineer familiar with various energy technologies. and a software engineer responsible for the maintenance and further development of the software.

It is important that if USAID should decide to support this project. it should do so at an adequate level. The U.S. contractors involved should be in a position to help inform the policy discussion at the highest levels.

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[1] We were assured by a number of people that such firms exist.

III. ANSWERS TO SPECIFIC QUESTIONS

A. GENERAL PROJECT EFFECTIVENESS AND IMPACT

1. To what extent has the project met the objectives of the original project agreement?

It appears that some of the items contained in the original statement of work were not addressed, at least not with much detail. Thus, we did not find any comparison of energy productivity or any scenarios for national development. The integration into the national planning framework was not undertaken and the analysis of the demand side, which completely ignores price effects, is incomplete. It is likely that many of these omissions are due to the unavailability of data at the time. However, today more recent and probably more accurate data are available and should be integrated into the project. For example, the Societe Nationale des Produits Petroliers (SNPP) has recently instituted a computerized data collection system that allows them to produce monthly statistics of sales by product, region and industry, even down to individual clients (Ref. 11). They expressed a willingness to make this data available and to generally cooperate with the project team in upgrading the database.

We were not able to determine whether the changes of project objectives that occured either at the time of the first project extension was in response to an expressed need of GOM or because some other tasks could not be done for lack of data. The second statement of work (Ref. 9) clearly redirects the project from data collection towards development of a computerized decision support system.

The EnVest model, as it presently stands, has not met all the

objectives set out for it in the first extension. For example, it lacks the ability to analyze technical feasibility, environmental and social impacts and specialized manpower requirements. The treatment of costs and the calculation of internal rates of return based on budget costs at official prices is inadequate. Since official prices for most products, and particularly for energy products are set by government fiat, they do not reflect the real resource costs. Accordingly, EnVest does not calculate real "costs" and the internal rates of return figures produced are irrelevant.

For example, the Moroccan government fixes low prices for "black" petroleum products such as diesel and fuel oil, while maintaining very high prices for "white" products such as gasoline. Consider two hypothetical projects that with equal costs produce equal amounts of white and black petroleum products respectively. The IRR calculated by ENVEST I based on the official price would be much higher for the white petroleum products, possibly inducing a government investor to favor it over the project producing black products. But this is precisely the wrong decision, because Morocco is chronically deficient in black products, while the Moroccan refineries have to export white products at a loss.

Shadow prices are intended to reflect the true costs and benefits to society of using or producing different goods. For the internationally traded goods such as coal and petroleum, shadow prices can be adequately approximated by world market prices. For non-traded commodities, such as electricity, they can be computed on the basis of the costs of traded inputs on the shadow price of the closest substitute.

Despite its shortcomings, EnVest does contribute a tangible project output that may allow MEM staff to be more efficient in their planning responsibility. It is quite likely that in the long run the EnVest-based planning capability will have a greater impact than the study originally contemplated in 1981. This is especially true if EnVest is further developed so that it fulfills the roles envisioned in the overly ambitious statements of work for the project extensions made in 1982 and 1983.

A good beginning has been made.

2. Has the project been a truly collaborative effort?

The early phases of the project were characterized by a very high level of activity on the US contractor's side, while GOM's participation was generally less than what has been hoped for. For example, the planned rural energy use survey could not be carried out in the way it had been intended. because MEM was unable to provide the necessary support.

Over the last year, however, MEM's interest and involvement in the project has improved markedly. The present level of cooperation and collaboration is very good. We have been informed that it was MEM's idea to present the model to outside parties on April 15. 1983. This presentation was apparently very successful (Ref. 12).

It appears that the U.S. and GOM staff collaborate very well at the operative level. The only improvement we can suggest is to work towards increased contact between the project team (U.S. and GOM staff) and the MEM decision-makers such as the Director of Energy, the Secretary-General of MEM and the Minister himself.

3. Has the project contributed to an improved capability in MEM to encourage energy policy changes?

The project has provided MEM with a computer model and associated procedures that will in due time give MEM the capability to evaluate and recommend energy investment plans that are more quantitative. This will be possible not only with respect to the energy producing sector, but also with respect to the energy consuming sectors.

The model should display specific facts that planning engineers often ignore, even in highly developed countries. One such fact is the enormous cashflow required by large-scale high-technology investments (e.g., nuclear plants) prior to start-up.[1]

Energy pricing is not an issue addressed by EnVest. So far, the GOM has not allowed the tariffs of certain energy forms (notably electricity) to rise to a point where ONE (the parastatal utility) can cover its costs or make investments with retained earnings. Under these circumstances, EnVest I simply indicates IRR's that are too low for all projects. The reason some of the tariffs remain too low is political; some ministries might successfully argue that the country would suffer from increased energy prices. However, DSI is trying to arrange a cooperative effort between MEM and the Ministry of Industry to undertake a study of the effects of changed energy prices upon the demand of the various energy forms and the extent to which other sectors of the economy would be affected.

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[1] For example, we recall an evaluation of tidal power in Canada that showed a positive IRR, but required the accumulation of an indebtednes during construction and was therefore shelved.

Energy conservation and conversion projects are included in EnVest's inventory of projects. However, they are not always treated analogous to other energy investments. For example, the IRR cannot be calculated for some of them because it is assumed that the firm using the energy will make the adjustment. Thus, EnVest I views it as a project with zero costs (!). It is possible to work with "Project Characterizations" similar to those of Ref. 3, but concerned with conservation projects (Ref. 5, material provided by Seattle City Light). A profitable area of work for MEM would be to establish such characterizations for specific conservation projects, based on accepted economic principles, and to include these projects into the portfolio considered by EnVest II.

Demand management strategies, primarily through pricing policies, are used by GOM only to influence the demand for gasoline. A perverse kind of "demand encouragement" through fuel subsidization is taking place in the industrial sector. Since the model is unable, in its present state, to display the real resource costs of these policies, it has also been unable to contribute towards changes in this area. It is hoped that eventually the analysis of the economic losses engendered by the price policy and demand management choices made by GOM will be a main function of EnVest.

4. Has the project improved integration of energy planning in overall economic planning?

Up to now the project has not yet had this effect. For example, it turned out that some of the people we talked to at the Ministry of Industry had never heard of the model and had, therefore, no idea whether and how it

could improve overall planning. MEM expressed an interest to use the model in the upcoming budget exercise which will be the first real test of its effectiveness.

5. Has (or will) the project help attract private or public (including multilateral) investment to the energy sector?

It is unlikely that a private banker would be swayed by the project alone to invest more in the Moroccan energy sector. However, inasmuch as the project succeeds in rationalizing Moroccan energy policy and the model becomes an expression of a new approach chosen by MEM and GOM, it can be a very effective communication tool. In other words, unless GOM decision makers believe in the model themselves and use it themselves, they will not be able to induce private and foreign investors to believe in it.

There are signs that the thinking is changing and that the project might serve as a catalyst to bring about a revision of energy policy. Many "sous-tutelles" (para-statals) that we talked to realize the need for a certain "verité des prix" (literally "truth of prices," i.e. prices reflecting economic costs) without which they find it difficult to accumulate the necessary funds required for their share of investments. They expressed the hope that the project would enable them to make a better case for policy changes which in turn give them credibility in financial markets.

6. Is on-going funding justified?

At this time, the project has gained the support of top officials at MEM. It is difficult to say whether MEM would continue the project if

AID terminated funding. It is possible that interest in EnVest would gradually disappear lacking qualified staff in permanent positions.

It therefore appears that on-going technical assistance is essential until the model and associated planning procedures have been routinely adopted by the permanent staff of MEM. This adoption is likely to take the form of a permanent "cellule de planification" (planning office) attached to the director of energy at MEM. AID should encourage the formation of this institution and, if possible, assure that its staff receive adequate training, technical assistance and support.

The tasks contained in the current statement of work (Ref. 10), namely:

- development of energy investment portfolios,
- energy pricing analysis,
- adapting the analytical tools to annual budget cycles,
- demand management and energy conservation,
- contact with parastatals,

are well chosen and should extend the usefulness of EnVest. Elsewhere in this report, we suggest that higher level programs in place of home-brew FORTRAN code be seriously considered as the basic software for EnVest II and that several base cases or master scenarios be developed.

B. EVALUATION OF THE ENVEST MODEL

1. Contribution to MEM Analysis and Decision Making.

At this time, the EnVest model does not yet contribute significantly to substantive analysis and decision-making at MEM.

However, there are a number of indications that EnVest probably will have a significant impact in the future notably:

- There was a public demonstration of EnVest to 80 GOM officials , including 4 Ministers, in April 1983 (See Ref. 12). This demonstration appears to have been quite impressive and to have stimulated some lively on-the-spot policy debates.
- The top officials of the Energy Directorate of MEM (Messrs. Bouhaouli and Benchekroun) appear to understand, promote and support the model and its use by MEM and other ministries.
- There are specific studies based on the use of EnVest or triggered by the EnVest way of thinking in progress, notably attempts to use EnVest for budgetary planning, modeling of the impact of tariff changes upon the demand side, and to evaluate a natural gas pipeline for ONAREP.
- There appears to be a recognition that the planning process requires an adequate and up-to-date data base of the general format used by EnVest.
- EnVest I highlights the generally adverse economic effects of unproven technologies and other uncertainties.

The computer model, EnVest, is more than a series of executable instructions for data handling and numerical analysis. The model provides graphical output of:

a) distributions of IRR for selected energy projects

b) demand/supply curves for energy, given energy demand and an energy portfolio .

c) bar graphs that show energy imbalances for future years.

One must separate the graphic output from the numeric output in order to evaluate the computer model. The graphic output might be informative, interesting to observe, stimulating in terms of policy discussion. etc. The numerical output. which of course provides the input for the graphic displays, must be evaluated in terms of accuracy, reasonableness and completeness.

The major contribution of the EnVest model has been its graphic output. The project team should be congratulated for understanding the type of displays that would stimulate MEM's interest in the model and display the policy issues.

The numeric output is relatively harder to evaluate than the graphic output. The contribution made by the numerical results to MEM's decision-making process has not been as great as the contribution made by graphic displays. But finally. it is the numbers. not the displays. that form the basis of policy analysis and planning.

In order to strengthen the acceptance of EnVest by GOM. we suggest the development and subsequent updating of several base cases (or master scenarios). The examples contained in Ref. 1 pertaining to the "gas" and "no gas" hypotheses are the beginning of such base cases. However, a more detailed consequence display will be required.

There are several factors that could cause EnVest to be forgotten and abandoned within MEM. The employees assigned to the project by MEM are under a civil service obligation for a limited time. They are, thus, temporary and do not necessarily provide much continuity. Also, there appears to be budgetary constraints that make the acquisition of relatively inexpensive computer hardware or software components difficult. On the

other hand, there exists a plan to create a planning office within MEM's Energy Directorate; this office should be the permanent home of EnVest and its data base.

2. Relation to GOM Energy Investment Formulations

It has been difficult to ascertain exactly what is the budgetary process for energy investments within GOM. The energy investment budgets and decisions are the result of discussion between MEM and the sous-tutelles (e.g., ONE, CDM, SOCOCHARBO) on one hand, and the Ministry of Finance and other Ministries on the other. The Ministry of Finance also must consider the opinion of other Ministries, such as Agriculture, Industry and Public Works.

Thus MEM will first review the investment proposals made by the parastatals under its control. Inevitably, the requests exceed the available funds and some hard choices on investments need to be made. The portfolio thus developed by MEM thereafter may be changed during discussions with the other ministries.

EnVest is, generally speaking, well suited to screen the projects proposed by the sous-tutelles and to combine them in a sensible portfolio. Since EnVest is a consequence simulator and relies heavily on man-machine interaction, it gives MEM the opportunity to work with the sous-tutelles during this process, rather than accept or reject their proposals. There is little doubt that EnVest could become an important mechanism for improving communication between parastatals that compete for budget allocations. Indeed, many sous-tutelles that the evaluation team talked to, expressed an interest in having some of their people trained in the use

of EnVest.

Other ministries within GOM would have limited or no use for EnVest as it is currently designed. EnVest is not, per se, a decision-support tool that a minister or non-technical person could handle. Its design and make-up require a technical specialist with prior training to both run and maintain the model. It is also unlikely that the model would be used outside of MEM with the exception of one or two of the sous-tutelles.

Because the EnVest model must be run and maintained by technical staff, it is highly unlikely that EnVest will contribute towards changing the investment budgetary process within GOM in the short run. However, as EnVest is developed further, and the MEM personnel become more familiar with its use, it may begin to improve and enhance the decision-making process at MEM.

3. Is the EnVest model predicated on sound analytical techniques, economic and engineering judgement, reliable data and/or estimation techniques, and effective programming skills?

Analytical Techniques:

EnVest I ranks projects according to their internal rate of return (IRR). It takes into account some specific uncertainties associated with a project, namely:

- energy production capabilities
- capital cost
- construction time

Project ranking is based on the 80 and 90 percentile points of production capability and capital cost, respectively. The choice of these

points is arbitary and a more suitable measure (e.g., expected capital cost per unit of energy delivered) could easily be used instead. The reasons why the energy producing capability of a project is a random variable is not explained; we suspect forced outages as well as market uncertainties.

The probability density function of the IRR is determined via Monte Carlo simulation and is displayed with the objective of alerting the planner to high-risk projects. At present, the random variables that cause the IRR to fluctuate are assumed to be independent. We suspect that the hypothesis of independence is not valid because "disaster" projects cost more. take longer to build. and produce less energy because of a single. usually technological uncertainty.

The IRR is based on the fundamental assumption of predetermined prices for all inputs and outputs of the project.

Since most of these prices are fixed by the government they do not properly reflect the economic opportunity costs. The IRR calculated by EnVest I does thus not reflect the relative economic merits of different projects. In its present form EnVest I is therefore unable to assist the decision maker in making economically optimal choices. (See also our answer to A.1)

Yet, based on our experience with a similar EPRI funded project (Ref. 4). we recognize the potential merits of a project screening procedure that considers uncertainty. EnVest I is a relatively "quick and dirty" estimation procedure which does not require great care and time in quantifying the source of risks and their cost, time loss, and performance

implications.[2]

EnVest II is a straightforward simulation consequence calculation over 20 years by 5 year increments of key financial and energy variables for a given project "portfolio." Its data base was established by E^3I (See Ref. 3).

EnVest II is in fact a very simple energy model. While we believe that the simplest energy model is likely to serve MEM's planning and decision-making processes best, a thorough review of existing and available energy models and programs would have been useful.

The EnVest II model is more accurately described as an energy supply model with a relatively simple energy demand model. Currently the model forecasts demand as either low, medium, or high. However, the implicit energy demand growth rates are not user selected because the model has in code one low, one medium and one high growth rate. Further, all demand sectors are assumed to be affected similarly with respect to the overall demand for energy such that, for example, if the phosphate industry experiences a uniformly low demand over the twenty-year forecast horizon. rural homes also are assumed to have a low growth rate for energy. Even more disturbing is the fact that the single high. medium, or low growth rate for all energy is multiplied by a fixed factor to derive each sector's respective high. medium or low growth rate. The fixed factor for each sector is based on historical data relating relative sector-energy demand growth rates to overall energy demand.

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[2] For more details on the treatment of uncertainty for development projects see Reference 14.

It should be stressed that in reality energy demand is neither more nor less important than energy supply. An energy model might simulate every TOE or GWH to the fourth decimal, yet if energy demand is estimated less accurately or less reasonably, of what value is the supply side accuracy? The demand shortfalls can be created by either supply shortages or rapid growth in demand.

It is therefore important that the demand side of the EnVest II model be developed. This development will have to take into account the effects of prices onto demand, (a request apparently already voiced by MEM), as well as interfuel substitution, conservation and other effects that might influence the fuel use matrix. These additions are necessary to turn EnVest into a policy analysis tool. Other improvements such as a regionalization and a further disaggregation of demand and supply might be desirable and should be considered for later versions.

Economic and Engineering Judgement:

The EnVest model does not attempt to optimize an objective function and, therefore, depends little on economic and engineering judgment. It is simply an elaborate accounting system that allows the user to display surplus and deficits in a number of different accounts. The only obvious instance where an economic concept was incorporated into one of the programs, the calculation of the IRR in EnVest I, we feel that an inappropriate choice was made. However, the program appears to be flexible enough to incorporate an economically more meaningful measure, such as the IRR based on real resources costs.

Economic and Engineering judgement also enters into the database.

particularly into the inventory of projects. Most assumptions made, seem to be reasonable, even though some individuals tend to disagree. This is especially the case for some of the sous-tutelles, such as ONE, which objects to a large portion of the capital cost of a multipurpose dams being charged to the costs of a hydro project. While it is true that the specific distribution of cost to different users may be arbitrary, the principle is sound and should be retained.

Regardless of whether the assumptions made are reasonable or not, they should be better supported and documented. We note the absence of literature reviews and proper referencing which are usually employed to support professional reasoning. Many parameters have to be accepted on faith, even though they could probably be well supported with solid evidence.

Data and Estimation Techniques:

The EnVest data base is possibly the most important feature of the model. The data have been described accurately in DSI's documentation and, under the supervision of Mr. Amanou, the two computer programmers from MEM are enhancing the editing capabilities of the program so that changes to the data can be made more quickly and easily.

This is an absolutely critical improvement. A frequently heard criticism was that EnVest was based on data that was no longer valid. Such criticism tends to unnecessarily discredit the whole project. Elsewhere we draw attention to new data that has become available at the level of the sous-tutelles (e.g., see Ref. 11). Consideration should be given to the designation of a "data-base manager", who, in cooperation with the

sous-tutelles, maintains the database and also updates the project inventory.

The estimation techniques used in EnVest are limited to the triangular density function used to derive IRR distribution for individual energy projects, and the input/output coefficients used to derive energy demand. We believe that for the input/output coefficients, at least. the estimation-technique choices made by the contractors lack fully documented support. There are no literature reviews and no documented discussions of the choices for estimating the many parameters normally found in a national energy model.

Programming Skills:

There is basically one person who has supervised the programming to date of EnVest: Ulrich Ernst. He is very capable and the AID team is fortunate to have at its disposal Mr. Ernst's professional capabilities as an economist and programmer. It is difficult to find a person such as Mr. Ernst who can understand and delineate the policy making process of MEM and also implement a computer model to help MEM's energy planning. Furthermore, Mr. Ernst is writing the EnVest documentation.

It should be added that it would be an unfortunate application of Mr. Ernst's skills if he were to remain as a programmer for any extension of the project. A professional computer programmer, or better still, the MEM technical civil servants, should revise, update and maintain the code. Computer models are never complete. they evolve, and over time gain sophistication and ease-of-use characteristics. EnVest is a nascent model and could use some polish. However, considering the limited time and

resources made available to the project team, the achievements made to date are quite respectable.

If any criticism can be levied against the EnVest programs it is that they contain too much processing code, much of it used infrequently. For example, the program EnVest I:TRI calculates the internal rate of return (IRR) for individual energy projects. The algorithm used to determine the IRR solves for the root of the polymonial equation for the future stream of net benefits. In many instances (almost 60% of the projects), a root can not be found that is unique, stable and converges. When this occurs, the EnVest I model is particularly useless because projects without an IRR can not be compared to other projects for which an IRR can be computed. It is recognized, of course, that there always exists an IRR for any project. However, it is not suprising that given the complicated algorithm for finding the IRR, and the limited amount of user memory in the Apple II computer (approximately 30K bytes after the disk operating system, p-code interpreter and Fortran run-time library are loaded into memory) the IRR cannot be determined in many cases.

The several programs that constitute EnVest II (ECON, DEM, OFF and GRAPH) are computationally simple. Numbers are added, multiplied, grouped into time periods, converted into units of either economic activity or energy consumption and plotted. We feel that a sophisticated computer language with lenghty algorithms is not necessary to provide an energy-balance accounting system. There are commercially available software packages for the Apple II microcomputer such as VisiCalc, SuperCalc, Execuplan, Spreadsheet, MultiPlan and many others which could provide the same output. Furthermore, VisiCalc which is available for

the Apple II and costs about $250 in the U.S., can be linked with companion software for color graphics and plotting. We feel that such software packages could have saved considerable time and money.

4. Is the EnVest Model well documented for users?

The EnVest model is described in the "EnVest" paper (Ref. 1) and Volumes I and II of the E^3I report (Ref. 2.3). These references can be used in lieu of an application manual.

Volume III of the E^3I report, which currently exists only as an incomplete draft, describes the programming aspects of the model and thus constitutes the user's manual.

The EnVest paper (Ref. 1) is well written and adequately describes the underlying analytical approaches. However, we suggest that future editions of this paper provide a list of references (there are no references given now) and indicate why none of the numerous existing and easily available models were used as a basis for EnVest. Also, the paper has not been widely distributed among Moroccan officials concerned with energy. As a consequence we frequently heard the charge that EnVest constituted a black box.

We also suggest that Ref. 1 be used as a basis for a scientific paper to be authored by employees of MEM and E^3I or DSI and submitted to a professional journal. This will make it part of the official scientific record and improve its value as a communication and education tool. We believe that, with the suggested changes, Ref. 1 is of sufficient quality to be accepted by some international journal.

Regarding the computer manual, overall, the documentation (about two-thirds of which has been completed to date) is very good. The project evaluation team was able to readily understand the workings of the model, the prompts. input commands and output displays. It is recommended that DSI include in its final and completed documentation photocopies of the video screens that show the user exactly what will appear on the monitor.

The use of EnVest will depend directly on the quality of the documentation. DSI should be encouraged to spend relatively less time on program development during the remainder of the project and relatively more time on enhancing the documentation. This corresonds to MEM's priorities and, if necessary, overrides some of our recommended improvements, such as, development of a pricing model or better handling of the demand side. At a minimum, the documentation should include a table of contents, tabs that separate the explanation and use of the different EnVest programs, sample problems with input and output listings, and a listing of error messages, what each means and what to do to resolve the error. The documentation should have one or more appendices that explain the mathematical considerations inherent to each program in the model.

C. INSTITUTIONAL AND MANPOWER IMPACT

1. Does the project appear to have a positive long term impact on MEM's institutonal capabilities?

If proposed "cellule de planification" does indeed become a part of MEM. there is a good chance that the project will have positive long term impacts on energy policy making in Morocco. It is important. however. that the staff of the cellule be permanent civil

servants, as opposed to two or eight year obligors whose tenure is a limited period required to pay back their scholarships. It is also likely that the cellule will need technical assistance for some time to come.

Ideally, the cellule would serve to inform the Director of Energy. and through him the Minister, about the different effects of GOM policies and investments in the energy sector. It is only through these offices and the people in them that the project can be effective. It is therefore important that the cellule be credible, well informed and responsive to the needs of the Director of Energy and the Minister (see our comments under D. 1 regarding data management).

The effectiveness of such "cellules" is frequently constrained by their inability to communicate their findings to the decision maker. In this respect the project is on the right track, with its emphasis on graphical output. If EnVest enables the members of the cellule to quickly prepare concise, lucid and well documented presentations for policy makers. it has helped overcome what is often a major stumbling block for many policy analysts and decision makers.

2. What is the experience with respect to the project's training component?

Ultimately, the project is designed to introduce the Moroccan policy makers to an effective way of conducting policy analysis. The success of the project should be measured by the extent to which we can induce them to use the model, if only indirectly through a member

of their staff. But formal models for analyzing policies are new in most ministries, including American ones, and most decision makers have to be "trained" in their use. It is up to the U.S. and GOM project staff to convince the decision makers of the usefulness of the EnVest tool and induce them to use it.

Analysis, as distinguished from computer programming, should be the primary skill that the project is intended to transfer. It is unclear to what degree the Moroccan counter-parts have been trained in the analysis aspects of the projects. We doubt that the Energy Management course at Stony Brook, New York, alone would have been sufficient. Once the model is fully developed it is likely that they will gain more familiarty by using it as a policy analysis tool and thus will gain more policy analysis experience.

It is unlikely that the project was ever intended as a vehicle for training Moroccan counterparts as Fortran programmers on Apple computers. An analyst analyzes the problem and lays out an algorithm for its solution. The programmer translates the alogrithm into a set of instructions that the computer can understand (note that Fortran is short for Formula Translation). Sophisticated computer programs have been developed to reduce and often eliminate the need for explicit formula translation. Furthermore we were told by a number of individuals that programming services are available from private consultant firms in Morocco.

D. DATA COLLECTION AND PRESENTATION

1. What significant new data has the project produced?

Volumes I and II of the E^3I report of October 1982 (Ref. 2 and 3) contain 3 main sets of data.. namely:

- consumption data, i.e. energy demand by economic sector and fuel type
- production data, by sector and fuel type, including the conversion industries
- project characterizations

The consumption and production data presented are not new, but were gathered from various Moroccan sources given in Appendices A, B and C of Ref. 3. Some of these sources are quite out-of-date, for example "ONE Rapport d'Activite 1978." This suggests that the data presented are probably not very accurate. More importantly, it stresses the importance of creating a mechanism for systematic data collection and updating within MEM.

Over the past three to five years, many parastatals have improved their data collection. The most advanced is probably SNPP which maintains a computerized data base on monthly sales by product, region (as fine as "cercles") and industry, down to individual clients (see Ref. 11). ONE's billing records, which are also computerized, are another potential source of useful information. ONE has also developed some simple econometric models for demand forecasting, (see Ref. 13), which could be updated with their most recent data. Such large efforts (SNPP has a data processing staff of 17 professionals) should not be duplicated by MEM. But summary statistics should be aquired, in machine readable form, and together with data from other "sous-tutelles" they should help to periodically update EnVest's fuel use matrix and baseline projections.

The project characterizations are quite nicely done, and useful to energy experts elsewhere. They constitute the basis for EnVest I. But one must also keep in mind that projects change quite frequently during the design phase so that the project characterizations have a tendency to be quickly outdated.

The effective use by MEM and other parts of GOM of these data can and should be tied to the information system that has evolved around the EnVest model. One of the Moroccan trainees could be made responsible for maintaining the data base. Summaries could be printed out at quarterly intervals and distributed to interested officials, perhaps together with the base cases perviously suggested. This process would allow the parastatals to check the accuracy and consistency of the data.

2. New Systems and Procedures for Data Collection

As discussed in Section D.1, the project has not yet lead to the development of systems and procedures for regular data collection and dissemination in the energy sector. However, the opportunity to do so exists. because the data base of EnVest will need to be periodically updated in accordance with a clearly specified data format. This data base. or summaries thereof could be disseminated among designated professionals of GOM and the parastatals.

The fact that a planning section (Cellule de Planification) will be set up within the Energy Directorate of MEM is encouraging. This Cellule would seen to be the logical organization for supporting and using EnVest and its data base. Several parastatals. particularly ONE. have expressed an interest in cooperating to provide information, in a specified format,

-if in exchange they receive summary statistics about other energy activities.

Expressions of this interest in information were frequently accompanied by a desire to know what happens to the data. Most parastatals are very interested in having one of their people trained in the use of the model. The most frequently voiced criticism was that EnVest was a black box (see also our comments on documenation). We suggest that the "sous-tutelles" use the model and encourage the project team to assist them in gaining an understanding of the workings of the model through the distribution of the documentation and information seminars.

E. CONTRACTOR PERFORMANCE AND PERSONNEL

1. Is the contractor personnel of appropriate professional calibre?

All indications are that Ulrich Ernst and before him James Bever were very fortunate choices for this project. James Bever was well respected for his tenaciousness and the work done by him displays a high professional competence. Ulrich Ernst has earned the respect and trust of his Moroccan counterparts. His professional work satisfies high professional standards.

It is our opinion, however, that Ulrich Ernst's capabilities are not fully used by this project. He should not have to spend so much of his time on tasks such as programming and writing EnVest's documentation. These activities divert him from conducting energy policy analysis, which is most unfortunate.

Ernst's effectiveness could be increased further with more and better professional support. The tasks that he should perform, i.e.

analyze policy options, inform the director of energy and through him the minister, etc., cannot be done effectively given the isolation in which he finds himself. To work effectively in the Moroccan environment, he needs technical professionals for back-up and the option of referring to specialists both within and outside of DSI for temporary assignments and consultation.

2. Was communication between U.S. and GOM participants adequate?

All the US participants in this project speak French to a degree that allows them to effectively communicate with their Moroccan counterparts. We are unaware of any communication difficulties. We feel that Ernst's European background and mannerisms are actually an asset and may have facilitated acceptance by MEM of him and the project.

It is our hope that over time the project team, US and GOM participants alike will be able to gain more frequent access to MEM decision makers. At this point it may be necessary to assist them through the provision of communication aids such as graphs, and advice on the design of presentations. We subsume this under the technical support mentioned in our response to E.1.

3. Were the contractors responsive to the needs of AID/Washington and USAID/Rabat?

We believe that as outside consultants we are not sufficiently familiar with the needs and requirements of either AID/Washington or USAID/Rabat to competently speak on this point.

F. COMMODITIES (HARDWARE)

1. Computer hardware selection: Is it reliable? Are parts and service available?

The Apple II Plus is both a reliable machine and well suited for the environment in which it must work. The MEM Headquarters building is fully enclosed and air conditioned so that dust (the natural enemy of electronic components) can be kept to a minimum. The machine is configured with three disk drives, a monitor, a printer and graphics interface card. Current U.S. prices for this hardware configuration (and using the new Apple IIe) is $3,500 exclusive of sales tax and any other duty.

A potential problem that MEM might have using the Apple II is the availability of disketts to store the data, copy the program and transfer the information to another machine. The project evaluation team discovered that disketts are difficult to procure in Morocco and cost about $10 per diskette (compared to about $3.25 per diskette in U.S.). The MEM should be supplied with approximately twenty diskettes per Apple II machine and three printer ribbons for each printer. Power conditioning equipment to regulate the outlet voltages is also a necessary requirement since the local power supply has variable quality. All the supplies mentioned above are available in Morocco and can be procured through local vendors either in Rabat or Casablanca.

AID should be encouraged to provide MEM technical personnel with commercially available software that is commonly used in the United States for planning. analysis and data base management. These software programs such as VisiCalc, Base II, Word Star (all registered trade mark

names) are used to organize data, ask "what-if" questions and prepare text in the same way that word processors operate. These software programs typically cost around $200 a copy, except for data base management software (e.g., dBase II) that costs $400. Prices include documentation booklets.

Parts and service for Apple hardware in Morocco are available from two companies in Casablanca: Digital Electronics and American Micro Computers. The firms sell parts for the Apple II and have trained personnel to repair the hardware.

The project evaluation team visited the American Micro Computers (AMEC) store in Casablanca on May 9. Mr. Housni of AMEC knew of DSI and was well aware that many different ministries in the GOM were receiving Apple microcomputers through the U.S. Government. The evaluation team felt reasonably certain that AMEC had both the trained personnel and machine inventory to handle all problems regarding Apple II maintenance.

2. Is the Apple Plus system the appropriate choice? How is it being used in the MEM and the Contractor's Rabat Office, other than to run the EnVest model?

The Apple II-Plus is really not the best choice of hardware for EnVest. The disk drives are used for mass storage whereas typical Apple II-Plus applications use only two disk drives. There is no rule that three or more disk drives is necessarily better or worse than two. However, to keep track of the diskettes and to make sure that the right diskette is in the appropriate disk drive makes EnVest all the more difficult to use.

The user memory in Apple II-Plus is 64K bytes, where a byte of user memory is the basic unit of addressable storage.[3] The EnVest is written in a very bulky program environment called UCSD p-code Fortran that uses almost half the 64K RAM for the DOS, p-code language interpreter and Fortran library. The user memory left in RAM for data input and output is quite limited. Thus, a lot of time is spent swapping files from the diskettes to RAM and vice versa.

Either an Apple III with 128K or an Apple IIe with the expanded 128K user memory board would be more appropriate for EnVest. It should be noted that the choice of UCSD p-code for developing EnVest has been very fortunate. UCSD p-code programs can literally be transferred to many other hardware machines without changing the source code. Therefore, a wide variety of hardware choices are possible for future EnVest development.

However, the project evaluation team recommends that AID and its contractor DSI investigate either upgrading the Apple II Plus with more user memory (with the provision that the UCSD p-code system will actually make use of the additional memory) or using another microcomputer that supports UCSD p-code and can be serviced in Morocco.

Presently, at MEM only the two programmers and their supervisor

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[3] Some computer background might help explain the term "user memory". The random access memory (RAM) of a microprocessor is also called "user memory." It holds both the program instructions and the data which are used to perform the tasks requested y either the program or the user. In addition, the RAM has reserved segments of memory for other functions, most importantly the disk operating system (DOS). The DOS handles files that reside on the mass storage media (e.g., disk drives) and controls the exchange of information between the user (at the keyboard and viewing the monitor), the RAM and the disk drives.

Mr. Amanou, are using the Apple II microcomputer to run EnVest. These technical personnel have been using the Apple II only to run EnVest. This is unfortunate because many improvements in MEM's operations could come about due to more extensive use of simple programs and commercially available software. Microcomputers lend themselves to applications written in BASIC (Apple Soft BASIC for example. which is included in the Apple II firmware), and to many commercial programs for planning and analysis. We have mentioned the "CALC" and data base programs. However. there are many more commercially available applications for the Apple II that could be used for budget planning. investment analysis, text processing, etc...

A major problem identified by the evaluation team is that even though the MEM and many other GOM agencies have the capable manpower to operate microcomputers, they do not have the funds for purchasing computer hardware and software. (Or more precisely. they have difficulty buying imported computer hardware-and -software technology). This constraint has given rise to an attitude that "re-inventing the wheel (with regards to software programs) is easier than purchasing readily available software." This attitude has persisted to the point whereby many man-months of programming time are spent creating programs that could be substituted with commercially available software that costs only several hundred dollars. It would be useful for AID to consider in its policy discussions and budget decisions how to approach this problem.

One possibility is a computer-equipment loan program whereby the U.S. Government would offer to lease the microcomputers to the GOM and its ministries. Leasing equipment is less risky than an out-right

transfer because if the microcomputer is not used, then the U.S. Government can take its hardware and allocate it to a more useful purpose.

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2. Perspectives on Moroccan Energy Demand and Supply, Vol. I, E^3I, Oct. 1982.

3. Moroccan Energy Data Base, Vol. II, E^3I, Oct. 1982.

4. Decision Framework for New Technologies, prepared by System Control, Inc., for EPRI, Oct. 1982.

5. Progress Report No. 1, Morocco Ministry of Energy and Mines, DSI, April 15, 1983.

6. Plan de Development Economique et Social 1981-1985, Vol. II, Royaume du Maroc, Ministere du Plan. See in particular Chap. IV. l'Energie.

7. Activite du Secteur Petrolier 1978, Ministere de l'Energie et des Mines, Royaume du Moroc. (Contains some statistics of energy forms other than petroleum).

8. Statement of Work, E^3I project for period 1/1/81 to 1/1/82.

9. Statement of Work, E^3I project for extension for period 1/2/82 to 9/30/82.

10. Statement of Work, DSI project extension for period 1/2/82 to 9/30/82.

11. Bilan Petrolier 1981, Societe Nationale des Produits Petroliers, Sce Etudes Commerciales, Casablanca, 1982.

12. Memorandum dated 4/22/83 by Gary Bricker, Project Manager, USAID/Rabat.

13. "Methode Econometrique de Prevision de la Demande d'Energie Electrique". ONE. 1979.

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APPENDIX: Response by the Contractor

This response refers to an earlier draft of this evaluation report. Some of the points raised have been taken into account in this final version. Note also, that the page references given no longer compare.

MEMORANDUM

TO: Daniel Kohler
FROM: Ulrich Ernst
RE: Second Reaction on the Evaluation Report
DATE: May 15, 1983
CC: Pamela Baldwin
Gary Bricker

I'd like to follow up on my quick reaction to the report (Memo dated 5/13) with some comments on two major issues; I also have a few nits to pick.

1. Project Evaluation and the Link Between EnVest I and EnVest II

Much of the EnVest programming was done with the understanding that decisions made now should not limit extensions and improvements later. In my earlier memo, I have given the example of ENVEST 2: DEM which offers the opportunity to introduce the results of any econometric demand analysis through the vehicle of energy use coefficients. I hope we'll be able to do that soon.

Similarly, the EnVest I programs are written to leave room for improvement and expansion. I believe that both the economic IRR and a financial IRR (under certain pricing assumptions) can be useful. Since official prices are much easier to come by than adequately documented shadow prices, we moved there first in the project characterizations.* It does not constitute a final objective. Rather, we should now move to real resource costs. How far we can move there depends on resources. Shadow pricing can be difficult, requiring careful guidance to establish the necessary grounding in economic theory among MEM analysts Thus, we probably have to move slowly at first. (Incidentally, I have found that the volatility of the financial IRR itself makes a pretty good case for less arbitrary resource valuation methods -- an unexpected "pedagogic" benefit.)

Another element that remains to be developed more is the treatment of uncertainty. Here again, we decided to use a relatively quick and dirty estimation method to get the concept established and accepted. Ultimately, though we need to derive the risk distribution by looking at sources of risk and their cost, time loss, or performance implications, similar to Reublinger's ideas. (Shlomo Reutlinger, Techniques for Project Appraisal Under Uncertainty, Baltimore and London, 1970.) The problem is, of course, that that too requires great care and time The urgent need for better demand and pricing analysis precludes doing more than a few sample cases. This may in any case be all we need, provided better cooperation with the sous-toutelles frees MEM from the task of essentially second-guessing them in project characterization and evaluation.

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* It is not uncommon to proceed in that fashion: see, for example, the UNIDO approach, Guidelines for Project Evaluation, 1972 as well as their 1978 publication

To that extent, we may be able to "de-emphasize" the link between EnVest I and EnVest II. In another sense though, a better division of labor and cooperation between MEM and its sous-toutelles would strengthen this link.

2. FORTRAN vs. VISICALC?

I am not quite sure about some of the conclusions and recommendations regarding the microcomputer and programming. They may need tightening and clarification. Let me address one major question here and a couple of minor points among the nits below.

As far as I can tell, the assertion that EnVest II could have been done (and should be done?--this suggestion is not clear) in VisiCalc that we eschewed the ease and potential savings of using off-the-shelf software to reinvent the wheel is attributable to an incomplete understanding of what the programs do. That is of course in turn at least partially attributable to the incompleteness of the documentation. Perhaps it is useful to look quickly at what one of the two core programs of EnVest II does and how it does it. and then return to our question.

ENVEST2:OFF simulates the behavior of the energy sector under given conditions of demand, and pricing and import policies. It does that by calculating year-by-year energy demand and supply balances given modifications of the energy sector structure through projects scheduled for implementation in the user-specified portfolio. ENVEST2 OFF consists of the main program and seven subroutines. The first subroutine, BASE, reads such things as demand informa tion on the current characteristics of the energy sector, or the desired import policy. After that, the main program enters the actual simulation loop. 20 years in one-year increments -- time-stepped simulation Each "year," the program checks whether any projects are scheduled for implementation. If yes, it calls either subroutine OFMOD1 or OFMOD2 to change the structure of the energy sector -- add a power plant, step up production in a coal mine, etc. After these modifications have been made, the main program calls subroutine VOLTS to determine the level and pattern of electricity production (annually there is no seasonal breakdown as yet). This subroutine is based on several assumptions: if there are nuclear power plants, they are assumed to be running at full capacity; hydro power plants may be producing at average-year or dry-year levels. Of the thermal power plants, none assumed to be placed in cold storage if capacity exceeds demand. Rather, all are assumed to be operating at some minimum level. Beyond that the program will choose among plants for production (and for plants that can use different fuels among fuels) according to fuel cost and availability. EnVest II deals with each plant individually, taking into account such things as gradual buildups of capacity or even location (e.g., kenitra cannot burn natural gas, if the pipeline only goes to Casablanca).

After VOLTS, total energy demand for petroleum products and non-petroleum primary energy forms is known. Available supply may act as a constraint on the effective derived demand for example, if the planner introduces a shale-burning power plant but no shale mining project, the power plant would remain idle and no "demand" would register. Armed with that information, the program then calls the final substantive routine in each loop, PETROL, which determines the production of petroleum products from imported crude or from the output of any shale

retorting process. Shale oil can either go into an upgrading plant or a special refinery. Allocation of total crude (imported plus synthetic crude) between the two refineries Samir and SCP, seeks to optimize with respect to existing demand for (a) fuel oil, and (b) diesel.

The remaining two subroutines, IMPRIM and GLOBAL simply report results. Thus, the only algorithms in the programs pertain to the choice of different production options. I am, therefore, not quite sure where the notion of a "sophisticated computer language with lengthy algorithms" (p. 25) comes from. The problem is not the actual writing of code, but the clear and consistent definition of accounting identities and decision rules.* If there is a way in which VisiCalc, etc. can in fact, reduce this substantive complexity, it needs to be explained. I suspect that a whiz at VisiCalc may be able to replicate ENVEST2:OFF; I doubt it, though. In any case, there is nothing in VisiCalc that would substitute for analysis and judgment any more than Fortran. The notion that "high-level software packages" somehow reduce the need for analysis is misleading. Unquestionably, certain functions could be performed more easily with VisiCalc. For example, the economic projections, in their present form, could be done by VisiCalc -- except the resulting file structure would be incompatible with the rest of the programs. In addition, once we go to a simple econometric model (we have experimented already with the 1975 input-output matrix), things will get a little more complex again.

We chose Fortran based on two premises: to have a language that would facilitate program maintenance by MEM staff beyond the project (and at that time, Fortran, PL/I, and Cobol were the only languages of which we found at least a passing acquaintance), and that could be run on other computers in Morocco as well with a minimum of program modification That's why Fortran "won out" over Pascal, a better choice from a programming point of view. Things have changed; hence, we are looking into the option of converting to Pascal. Meanwhile, we are using commercial software for specific purposes, such as VisiCalc for ad-hoc calculations and some broader data base management functions or perhaps Visifile for storage and retrieval of simulation summary results, etc. Each software/language option should be used where it performs best. not universally because it's there.

3. Picking Nits

p.4 - We've always had reasonably to very good data on sales, especially petroleum products and electricity. An econometric analysis of such data could be useful, especially with respect to price effects. However, to develop long-term forecasts of energy "needs" based on economic growth patterns, we have to link energy consumption to economic activity level, and that gets a lot harder. The SNPP and similar data collections will help, but they won't solve our main problem.

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* Another example writing the program for the demand/supply bar graphs took half a day. Probably not much more than it would take with Visiplot Developing a satisfactory treatment of exports of petroleum products for these summary graphs took two days.

p.9 - Conservation is one of our major concerns, as evidenced by the first stab at transportation. With respect to specific projects, though, the division of responsibilities within the GOM makes it difficult to get at the necessary technical and economic dab. We hope that improved cooperation with the Ministry of Industry will help.

p. 15, second paragraph - As I already mentioned in my 5/13 memo, current staffing is less transitory than it would appear in the writing.

p. 17, second paragraph, last sentence - How does that relate to the interest expressed by the sous-toutelles?

p. 18 - EnVest does not rank projects. The 80th and 90th percentiles have been used for illustration.

p. 21, 1st/2nd paragraph - Actually the supply-side simulations are rather gross as well. Demand projections are a little more flexible since the fuel use matrix can be changed.

p. 27 - The recommendation on documentation needs to be reconciled with that on page 34. The recommendations on format are useful.

p. 30 - The project has not trained anybody as Fortran programmers. See section 2 on "Sophisticated Computer Programs."

p. 32 - Good recommendation and we have started work on that.

p. 37, 1st paragraph - You don't know dust in Rabat! Even so, the Apples have performed reliably.

p. 39 - Mr. Housni is given to hyperbole.

p. 40 - Since one of the disk drives is permanently occupied by the system disk, the user only has to keep track of two disks which are interchangeable. Even so, maybe a hard disk or at least double density or 8" disks should be considered.

p. 41 - P-Code is transportable as long as any required intrinsic units are available.

Upgrading the Apple II Plus with more user memory: 64K is the maximum: maybe you are referring to disk emulators. (Apple III and the new Apple IIe use bank switching.)

The Apples are beginning to be used for other things than EnVest, applications involving VisiCalc. I agree in principle with the recommendation to provide more software, but it has to be done as a package including analysis, training, and continuing technical support. I have seen too many Wordstars, etc. sitting there waiting for someone to display it effectively.

p. 42, end of 2nd paragraph - Two problems with that: first, the factual backup for this assertion isn't all that strong. Secondly, purchase of U.S. software has its own problems, such as manuals in English, let alone employment and

training effects What is needed is a careful balancing of purchase, adaptation, training and new development. Oversimplifing the choices won't help.

p. 43, paragraph 2 - I'd like to think of EnVest as the main tangible output, but only a means to more important accomplishments.

p. 44, paragraph 5a - I agree with that up to a point as discussed above.

MOROCCO ENERGY PLANNING & CONSERVATION PROJECT (936-5728)

(Project Description Excerpted from PROAG 8/31/82)

1. Background

Reference is made to Project 936-5703, Assessment of Energy Perspectives, which developed a viable information base for energy investment planning and strengthened the overall institutional capability of Morocco's Ministry of Energy and Mines (MEM) in the area of planning, analysis, and decision-making. This predecessor project initiated the training of Moroccan counterparts to evaluate overall energy supply and demand strategies, using a computer program designed especially for the Grantee's public investment decision-makers.

2. Purpose of Project 936-5728

The purpose of the current project, stemming from a second request from the MEM to A.I.D., is to provide technical assistance to Morocco via a U.S. firm under contract to A.I.D. so that it may effectively address national energy problems through analysis, institution building and comprehensive planning.The Project will employ an integrated approach that encompasses the full range of energy sources (conventional and renewable) and that investigates each energy using sector from traditional rural households to modern large-scale factories.

Towards these ends, the Project will provide two major categories of technical assistance: (1) energy planning and management and (2) development of programs to promote efficient energy consumption and conservation. These two activities will include mechanisms for Morocco to share ideas and experiences with other A.I.D. cooperating countries participating in the program and to benefit from energy management research conducted directly by A.I.D.

The Project will allow A.I.D. to continue to work hand-in-hand with the MEM's new planning staff in applying the energy model, analysis of energy problems, and on-the-job computer training so that the MEM staff will be competent enough not only to operate the existing program but also to alter it to reflect the dynamic energy supply and demand environment of Morocco.

3. Implementation

A team of U.S. energy specialists will be organized to work in cooperation with specialists assigned by the Energy Directorate of the Moroccan Ministry of Energy and Mines.The team will be composed of a resident energy project advisor, approved by the Moroccan Government, who will act as the principal advisor for the project and who will determine the sequence of activities necessary to accomplish the goals intended for this project. In addition to the resident advisor, there will be a number of specialists who will examine the specific sectors that need to be studied in depth but for shorter periods of time and in different stages.

The following prioritized listing of actions required is intended as broadly indicative of work to be performed under the Project. These tasks will be undertaken by the Government of Morocco and the USAID Project team:

(A) The analytical model developed in Project 936-5703 will be further refined to provide information for MEM's annual capital and operating budgets.

(B) At least three basic methods will be used to determine impacts of energy prices on other sectors of the economy. Case studies, statistical analysis of

information available at the Ministry of Industry, and modified input/output analysis will be used.

(C) A number of strategies for developing energy supplies and managing energy demand will be identified and evaluated using the analytical tools developed in Project 936-5703. Major supply alternatives include a mix of coal, shale, oil, gas, condensates and renewable energy.

(D) The Project team will work with Moroccan parastatal organizations such as ONAREP, CDER and SOCOCHARBO to determine how these organizations can use the information and analytic systems developed by the Project team.

(E) Computer software will be provided to maintain inventory records of petroleum supplies. Additionally, a detailed report will be prepared to assess patterns of use which can subsequently be used for multiyear planning.

(F) A training program will be conducted for MEM staff. Seminars in project design and cost analysis will be given to enable MEM staff to verify cost estimates and to enter new projects in the analytical system.

(G) Assistance will be provided in the areas of demand management and conservation with the primary aim of reducing wasteful use of oil and electricity, especially in the transportation and industrial sectors.

The above tasks will be accomplished using an on-the-job training mode. The U.S. team will provide Moroccan personnel with all necessary training in the use of the analytical model, including training needed to strengthen computer analysis using the model so that they may control the data base and redesign the software programs. Upon approval by A.I.D., the training may also include regular in-country English language classes for key Moroccan counterparts.

4. Level of Effort

A. United States

It is estimated that a total of 24 person/months will be required for the Project over a period of 15 months. One resident advisor will be responsible for project coordination and local management and guidance of the professional development of Moroccan counterparts.

In those energy areas where the resident advisor is not expert, visiting specialists would be required for limited periods in fields such as transportation, industry, agricultural production, rural and urban energy, energy information systems, investment analysis, conservation, energy audits, and pricing.

B. Government of Morocco

It is expected that the Grantee would provide approximately 36 person-months of effort. Counterparts will be assigned to the Project pursuant to Section 5.2. of the Agreement.

Drafted by J. Bever,NE/TECH/HRST:es:4/27/83:x23228:1703h.

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E.O. 12356: N/A
SUBJECT: ENERGY POLICY DEVELOPMENT AND CONSERVATION
- (936-5728): MOROCCO SUB-PROJECT EVALUATION AND
- USAID FOLLOW-UP

REF: (A) STATE 83296, (B) REPORT OF EVALUATION TEAM,
- 5/13/83

1. EVALUATION TEAM FOR MOROCCO ENERGY PLANNING ASSISTANCE SUB-PROJECT UNDER ST/EY'S EPDAC PROJECT (936-5728) COMPLETED ITS WORK AND REPORTED FINDINGS AND RECOMMENDATIONS TO USAID, ST/EY PROJECT OFFICER ON TDY IN RABAT, AND GOM ON FRIDAY, 13 MAY. FINDINGS WERE POSITIVE AND INDICATED NEED TO EXPAND/EXTEND EFFORT TO ASSURE MORE LASTING EFFECTS, PARTICULARLY RATIONALIZATION OF PRICING POLICY AND ENERGY INVESTMENT BUDGET. TUESDAY MAY 17 USAID/RABAT DIRECTOR CHASE AND MEM ENERGY DIRECTOR BOUHAOULI OUTLINED MAJOR THRUSTS OF A FOLLOW-ON PROJECT TO START FY 84, WITH SOME ADJUSTMENTS AND MODIFICATIONS IN SCOPE OF PROJECT.

2. PER USAID-ST/EY DISCUSSIONS DURING BALDWIN TDY, TRANSITION PERIOD FROM NOVEMBER 1983 TO OCTOBER 1984 WILL PROCEED AS FOLLOWS:

A. USAID WILL ASK NE/DP TO TRANSFER DOLLARS 200,000 FROM EITHER THE MISSION'S FY 83 OYB OR NE/BUREAU BUDGET TO ST/EY FOR EXTENSION OF THE CURRENT DSI CONTRACT SO THAT CONTINUITY OF ASSISTANCE, CONSIDERED CRITICAL BY GOM AND BY EVALUATION TEAM, CAN BE ENSURED.

B. ST/EY WILL ALLOCATE 200,000 FROM FY 84 EPDAC PROJECT FUNDS TO COMPLETE BUDGET FOR TRANSITIONAL YEAR.

C. SCOPE OF WORK FOR DSI WILL BE MODIFIED TO REFLECT KEY RECOMMENDATIONS OF EVALUATION TEAM RE: MORE EMPHASIS ON POLICY ANALYSIS (AS OPPOSED TO COMPUTER PROGRAMMING) BY RESIDENT ADVISOR; USE OF SHADOW PRICES IN IRR CALCULATIONS IN ENVEST MODEL; FURTHER DEVELOPMENT OF DEMAND FUNCTIONS AS VARIABLES WITHIN MODEL; DEVELOPMENT OF BETTER AND MORE DYNAMIC DATA BASE; AND EXPANSION OF USE OF ENVEST WITHIN MEM AND KEY PARA-STATALS.

3. USAID WILL REQUEST AID/W APPROVAL TO PROCEED DIRECTLY TO PP DESIGN OF FOLLOW-ON PROJECT, SO THAT PROJECT AUTHORIZATION AND IMPLEMENTATION CAN PROCEED ACCORDING TO THE FOLLOWING SCHEDULE:

A. PP COMPLETED AND TRANSMITTED TO AID/W: DECEMBER 31, 1983.

B. PP APPROVED: JANUARY 31, 1984.

C. PROAG SIGNED: FEBRUARY 28, 1984

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D. RFP FOR PROJECT CONTRACTOR PUBLISHED IN CBD: MARCH 15, 1984.

E. CLOSING DATE FOR BIDS: MAY 1, 1984.

F. CONTRACT SIGNED: JUNE 30, 1984.

G. TA TEAM, INCLUDING TWO RESIDENT ADVISORS, ARRIVES IN MOROCCO NLT SEPTEMBER 1, 1984.

4. THIS SCHEDULE WILL ENSURE REASONABLE OVERLAP BETWEEN PRESENT DSI TEAM AND FOLLOW-ON PROJECT CONTRACTOR TEAM. COMPETITIVE PROCUREMENT OF CONTRACTOR DOES NOT IMPLY USAID OR GOM DISSATISFACTION WITH DSI AND DOES NOT PRECLUDE DSI FROM BIDDING. CURRAN

NEW PROJECT NARRATIVE

($ Thousands)

Project Number	:	608-0180
Project Title	:	Energy Planning Assistance
Proposed FY 1984 Funding:		$1,100 (GRANT)
Proposed FY 1985 Funding:		$1,400 (GRANT)
Life of Project Cost	:	$3,657 (GRANT)
Appropriation Account	:	Selected Development Activities (SDA)

The purpose of the Energy Planning Assistance Project is to assist the Ministry of Energy and Mines (MEM and other GOM energy-related entities) in the development and implementation of viable energy policies and strategies, programs and projects for the 1985-2000 period. The project will support GOM efforts to ameliorate Morocco's currently critical problems of balance-of-payment, deficit, external debt burden, foreign exchange shortage and development constraints caused by shortages of energy and capital.

It will also strengthen the GOM's capability to develop and implement such policies, strategies, programs and projects in the Ministry of Energy and Mines and associated entities, and to attract both expatriate and local private investment in the energy sector of Morocco. The timing for the follow-on project is particularly propitious since the current economic climate has strained the GOM's own resources to the point that key investment decision-makers are increasingly receptive to private market solutions to their economic development problems. They are especially open to consider real cost pricing. The new climate is also very conducive to policy dialogue which could lead to increased influence of the private sector.

During project implementation the following problems will be addressed:

- A critical weakness in the current Moroccan economy, including a virtual lack of foreign exchange for investment, which is exacerbated by the country's dependence on oil imports to meet 85% of its commercial energy.

- A currently inefficient pattern of energy consumption and resource allocation because of inefficient fuel and electricity pricing structures, lack of conservation programs and

inability to ensure the most rational allocation of different energy sources among end-users;

- Non-existence of a good data base and dynamic information system for ongoing energy analysis;

- An expressed need for better understanding and consideration among GOM decision-makers of the role of energy in the Moroccan economy, and in particular the new energy demand that is created by the development of other sectors of the Moroccan economy, including industry, electric power, transportation, agriculture, housing and urban development; and

- A shortage of trained manpower and organizational capability in MEM to deal with each of the above problems.

This project is a follow-on to centrally-funded activities in energy planning and policy development, which were provided under ST/EY's Energy Policy and Planning Project (936-5703) and Energy Policy Development and Conservation Project (936-5728). Under the ST/EY projects, the GOM and U.S. personnel jointly developed a new analytical approach to Morocco's energy investment options. Called EnVest, this microcomputer-based energy model enabled MEM to begin the systematic analysis of proposed energy supply projects in a comparative mode, evaluating projects in oil, gas, coal, oil shale, renewables and conservation and comparing them for the first time with each other in terms of their internal rates of return, inherent technological risks and uncertainties, foreign exchange requirements and expected energy output. The model also allows GOM energy planners to develop and compare alternative scenarios in which specified levels of energy supply are provided through alternative investment portfolios of energy projects based on variable assumptions such as the level and availability of natural gas, which is now being explored.

The GOM is now anxious to make maximum use of this analytical tool and of other techniques and activities to insure more efficient use of scarce investment resources and user allocation of its energy supplies. To succeed, Morocco must address and find solutions for the problems described above.

The project fits within AID's Energy Policy adopted in early 1981 and Energy Sector Strategy developed in 1982. It is also consistence with the four cross-cutting concerns of the Administration -- policy dialogue, institutional development, technology transfer and reliance on the private sector. Finally, it addresses Congress's concern, stated in Section 106 of the FAA, about the need to aid developing countries to alleviate their energy problems.

In its Energy Policy guidance, the Agency has stated its intent to "emphasize those areas in which AID has special competence and experience: analysis and planning assistance, project preparation and feasibility studies, training and institution-building..." (Energy Assistance Policy Paper, January, 1981, p. 12).

In the December 1982 draft Energy Sector Strategy, the Agency identified energy analysis, planning and policy development as the first of four major areas of AID activity within the energy sector. Specifically, AID would:

> "Help develop the knowledge and capability for the design and implementation of sound energy policies... giving priority attention to analysis of pricing policies and initiation of a dialogue with the government on revision of these as appropriate. Domestic policies in the areas of investment and tax codes, trade, and environmental or natural resource management will also be encouraged, especially as these are conducive to private investment." (State 356138, 23 December, 1932).

The Congress found in 1979 that "assistance for the production of energy from indigenous resources... would be of direct benefit to the poor in developing countries because of the overwhelming impact of imported energy costs upon the lives of the poor and their ability to participate in development." (FAA, Section 106(D)). Congress authorized AID to furnish assistance in the form of data collection and analysis, training, research and development, institutional development and scientific interchange. (Ibid).

The project will be implemented over a 4 year period and will consist of the following components:

1. Provision of two resident energy advisors over the four year life of the project. The Chief of party will be a senior-level economic/energy policy analyst. The second resident advisor will be a specialist in information systems and data management.

2. Short-term technical assistance in specialized areas, to produce specific analyses and/or to provide advice, training or other services on an as-needed basis.

3. Training, based both in Morocco and in the U.S., encompassing short-term seminars, on-the-job skill building and academic degree training. Academic training is expected to be in the fields of energy economics, finance, systems analysis, law and management. The training component will include eight in-country seminars for 10-15 persons each up to 15 slots in U.S. based short courses and/or seminars (including attendance by several GOM staff members at the AID-funded Energy Management Training Program at SUNY/Stony Brook), and four degree programs at the M.S. level in U.S. universities. English language training will also be provided for key MEM personnel. The total cost of training to AID is estimated to be $910,000.

4. Provision of computer hardware and software, including programming services, to upgrade and expand the current analytical model and its use by MEM and its affiliated entities such as ONAREP, ONE, SOCOCHARBO, etc., as well as other micro-computer applications relevant to energy planning and management. Programming services will be supplied to the maximum extent possible by Moroccan programmers in the GOM and in private Moroccan firms. AID will provide microcomputers and commercial software.

While the project will not include any explicit research components, it is expected to follow the pattern established in the centrally-funded predecessor activity by breaking new methodological ground in energy analysis. USAID will work with S&T/EY, as it has in the past, to ensure that innovations stimulated by the project are made widely available to other AID entities and replicable where appropriate in other countries.

6/21/83

(Excerpt from Bever to Donnelly memo)

To: NE/DP, Gerry Donnelly
From: NE/TECH/HRST, Jim Bever JB 6/21/83

Subject: Transition of S&T/EY Morocco Energy Projects to NE Bureau--Energy Policy Development & Conservation Project (936-5728) and Conventional Energy Technical Assistance (936-9997)

Energy Planning Assistance

Energy planning assistance has been underway in Morocco through a subproject of S&T/EY's world-wide Energy Policy Development & Conservation Project, implemented through a contract with Development Sciences Inc. (DSI) and a subcontract with Energy & Environmental Engineering Inc. (E3I.) The contract covers 24 person-months of effort, including approximately 10.5 person-months allocated to the Resident Director, Ulrich Ernst. The remaining labor is being provided by short-term experts in-country on a regular basis.

The DSI contract expires November 30, 1983, although the PACD on the PROAG is January 31, 1985. DSI has, with approval of USAID/Rabat and S&T/EY, accelerated its efforts this Spring in response to Government of Morocco requests, most notably the requests for a demonstration of the energy investment model (ENVEST) to a Cabinet-level meeting of GOM ministers and for followup training provided to several ministries and parastatals. As a consequence, most of the project's short-term technical assistance budget has been used up, leaving sufficient funds for only a "bare-bones" operation, with which DSI is unable to respond fully to the growing and increasingly sophisticated GOM requests for assistance with energy pricing, policy and investment analysis. In a recent evaluation of the sub-project, a team of outside analysts recommended that the level of effort be increased substantially for the next year and that technical assistance in energy planning should continue for up to another five years.

S&T/EY and USAID/Rabat have agreed in principle on plans for a transitional year between the current S&T/EY funded activity and a new USAID project, scheduled to get underway late in FY84. S&T/EY has no FY83 funds available but is prepared to allocate approximately $200,000 in FY84 funds to Morocco during the first quarter of the fiscal year, provided that that amount is matched by USAID/Rabat and/or the NE Bureau. It would be best if the NE contribution could be made in FY83 to ensure that the difficulties of obligating funds during the first few weeks of the new fiscal year do not cause a funding gap that would make it necessary to terminate the Resident Director and close DSI's office in Rabat. The combined S&T-NE funding of $400,000 would enable the assistance to continue up to and slightly over the estimated time expected to be required for PP preparation and approval and competitive procurement of a contractor for the new USAID project (contractor scheduled to arrive in Morocco between July 1984 and September 1984.) The GOM, USAID, S&T/EY and DSI all believe it is important to have a few months overlap between DSI and the successor contractor (who may or may not be DSI.)

The transitional year would focus on activities that implement the recommendations of the evaluation team and extend the useability and actual use of the EnVest model, as requested by the GOM. More specifically, the tasks will be:

1. Carrying out analysis of Moroccan energy pricing policies, including an analysis of the existing system, a measure of the economic costs of its

deviations from "true" costs, and assistance in making investment decisions that better reflect economic pricing assumptions.

2. Assessing the potential for energy conservation and fuel substitution in the agriculture sector, particularly in the context of various modernization and agricultural investment programs that are planned.

3. Calculation of the internal rates of return for the many GOM energy project proposals now included in the EnVest model, using shadow prices rather than the actual prices in effect in Morocco, as heretofore done.

4. Expanded analysis on current energy demand and development of demand projections that are likely to be more accurate than those now used, which are based on the projections of economic activity under the current Five-Year Plan.

5. Improvement of the data base management function within EnVest, including improvements in both the hardware and software used for this purpose, so that data can be updated regularly and made more accessible to policy analysts.

6. Development of new data to improve the GOM's energy analysis, including not only energy-specific data but also data on energy-economic interactions such as foreign trade, national and sectoral investment and better information on various levels and kinds of economic activity.

7. Further training of GOM personnel in all of above areas.

8. Improvement of EnVest documentation to make the programs and manuals easier to use.

9. Expanded presentations of EnVest and communications with more potential users.

As recommended by the evaluation team, DSI plans to allocate virtually all of its Resident Director's time to economic and policy analysis and to add additional field personnel for data base management and computer technology transfer.

As noted in the ABS, the follow-on project, Energy Planning Assistance (608-0180), would have an LOP of $3,657,000 and would be funded for four years. The key outputs would be continuations of the above items from the recently completed evaluation and the key inputs would be as follows:

1) Two resident advisors, one a senior energy & economic policy analyst and the other an information systems & data management specialist. Estimated budget for full support over four years: $1.5 million.

2) Short term technical advisors over the four years in special energy areas, eg, energy & agriculture, etc. Estimated budget over four years: $625, 000.

3) Training--on-the-job, in-country seminars, participant training in U.S. both short-term and up to four M.S. degree candidates. Estimated budget over four years: $900,000.

4) Computer hardware & software & programming--predominantly microcomputers. Estimated budget over four years: $625,000.