CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) — PART I

Report Symbol U-447

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
Niger Solar Energy Development	683-0235	USAID/Niger

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) 82-3

☒ 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 78	A. Total $ 1,899,800	From (month/yr.) October 1978
B. Final Obligation Expected FY 80	B. U.S. $ 500,000	To (month/yr.) September 1982
C. Final Input Delivery FY 81		Date of Evaluation Review September 7, 1982

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
1. Close out the Project and deobligate remaining funds (approximately $260,000).	USAID/GDO and USAID Controller	September 30, 1982
2. Using separate funds (not yet identified), undertake in-depth study of scientist/engineer/technician problem which caused this Project to fall short of its objective.	USAID/GDO in collaboration with S and T Bureau	September 30, 1983

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)

Clarence Kooi, Energy Advisor, REDSO/WA
Albert Wright, Deputy Director ONERSOL, Project Coord.
Winfield Collins, Project Officer
Cameron Pippitt, Evaluation Officer
Jesse Snyder, General Development Officer

12. Mission/AID/W Office Director Approval

Signature

Typed Name John Lovaas, Director (acting)

Date 10/2/82

AID 1330-15 (3-78)

THE EVALUATION REPORT IS IN THIS FORMAT

PROJECT EVALUATION SUMMARY (PES) — PART II

The following topics are to be covered in a brief narrative statement (averaging about 200 words or half a page per item) and attached to the printed PES facesheet. Each topic should have an underlined heading. If a topic is not pertinent to a particular evaluation, list the topic and state: "Not pertinent at this time". The Summary (Item 13) should always be included, and should not exceed 200 words.

13. **SUMMARY** - Summarize the current project situation, mentioning progress in relation to design, prospects of achieving the purpose and goal, major problems encountered, etc.

14. **EVALUATION METHODOLOGY** - What was the reason for the evaluation, e.g., clarify project design, measure progress, verify program/project hypotheses, improve implementation, assess a pilot phase, prepare budget, etc? Where appropriate, refer to the Evaluation Plan in the Project Paper. Describe the methods used for this evaluation, including the study design, scope, cost, techniques of data collection, analysis and data sources. Identify agencies and key individuals (host, other donor, public, AID) participating and contributing.

15. **EXTERNAL FACTORS** - Identify and discuss major changes in project setting, including socio-economic conditions and host government priorities, which have an impact on the project. Examine continuing validity of assumptions.

16. **INPUTS** - Are there any problems with commodities, technical services, training or other inputs as to quality, quantity, timeliness, etc? Any changes needed in the type or amount of inputs to produce outputs?

17. **OUTPUTS** - Measure actual progress against projected output targets in current project design or implementation plan. Use tabular format if desired. Comment on significant management experiences. If outputs are not on target, discuss causes (e.g., problems with inputs, implementation assumptions). Are any changes needed in the outputs to achieve purpose?

18. **PURPOSE** - Quote approved project purpose. Cite progress toward each End of Project Status (EOPS) condition. When can achievement be expected? Is the set of EOPS conditions still considered a good description of what will exist when the purpose is achieved? Discuss the causes of any shortfalls in terms of the causal linkage between outputs and purpose or external factors.

19. **GOAL/SUBGOAL** - Quote approved goal, and subgoal, where relevant, to which the project contributes. Describe status by citing evidence available to date from specified indicators, and by mentioning the progress of other contributory projects. To what extent can progress toward goal/subgoal be attributed to purpose achievement, to other projects, to other causal factors? If progress is less than satisfactory, explore the reasons, e.g., purpose inadequate for hypothesized impact, new external factors affect purpose-subgoal/goal linkage.

20. **BENEFICIARIES** - Identify the direct and indirect beneficiaries of this project in terms of criteria in Sec. 102(d) of the FAA (e.g., a. increase small-farm, labor-intensive agricultural productivity; b. reduce infant mortality; c. control population growth; d. promote greater equality in income; e. reduce rates of unemployment and underemployment). Summarize data on the nature of benefits and the identity and number of those benefitting, even if some aspects were reported in preceding questions on output, purpose, or subgoal/goal. For AID/W projects, assess likelihood that results of projects will be used in LDC's.

21. **UNPLANNED EFFECTS** - Has the project had any unexpected results or impact, such as changes in social structure, environment, health, technical or economic situation? Are these effects advantageous or not? Do they require any change in project design or execution?

22. **LESSONS LEARNED** - What advice can you give a colleague about development strategy, e.g., how to tackle a similar development problem or to manage a similar project in another country? What can be suggested for follow-on in this country? Similarly, do you have any suggestions about evaluation methodology?

23. **SPECIAL COMMENTS OR REMARKS** - Include any significant policy or program management implications. Also list titles of attachments and number of pages.

24. TECHNOLOGY TRANSFER - Response to STATE 191170 and STATE 81077.

25. RECOMMENDATIONS

13. Summary of the Evaluation

The Niger Solar Energy Development Project, 683-0235, was designed to "assist Niger's Office of Solar Energy (ONERSOL) to develop, test and apply solar energy technologies."

It intended to do this by: 1) providing architectural services for the construction of the new ONERSOL building, 2) providing instruments, laboratory equipment, a vehicle and two solar pumps, and 3) providing technical assistance and training. The final result was expected to be a team of Nigeriens working at ONERSOL with proper facilities to develop, adapt and transfer solar technologies, primarily solar water pumping, to the Nigerien rural poor. This objective was not attained. Nevertheless, certain elements of the project were accomplished. The ONERSOL building was completed and it is an excellent facility. Equipment, instruments, and a vehicle were supplied, and training of one person was accomplished. However, due to lack of qualified scientist/engineers at ONERSOL (only one qualified Nigerien) and failure of both AID and ONERSOL to recognize and correct this deficiency, the major objective was not attained. The absence of qualified personnel appears to be due to lack of technical and engineering schools in Niger and to the low salary structure of ONERSOL. It would be of little use to continue this Project without correcting these deficiencies.

Therefore, this evaluation recommends that the Project be terminated with remaining funds (approximately $260,000 out of the budgeted $500,000) deobligated.

Furthermore, it was recommended by the consultant who prepared this evaluation that AID undertake an in-depth study of the technical/engineering/scientific training and personnel availability in Niger. The scarcity of scientific/engineering personnel in Niger is likely to be a serious constraint on development projects other than those concerning energy. The USAID General Development Office, recognizing the serious implications of this situation, will pursue this recommendation with AID/W's S and T Bureau.

14. Evaluation Methodology

This is the final, and only, evaluation of the project. It s purpose is to measure progress and recommend future action. The approach taken was to:

(a) determine what happened, by consulting involved personnel and written records, and by inspecting the ONERSOL facilities, equipment, and activities.

(b) determine the measure of progress and success of each event in relation to the project plan and reasonable expectations.

(c) determine what monies were expended, whether the product was delivered and is in place, and what funds remain.

(d) develop recommendations to reasonably terminate project and study future AID action to correct deficiencies which presently inhibit Nigerien progress in energy development.

The key personnel consulted were:

(a) Albert Wright, Deputy Director, ONERSOL.

(b) Abdou Moumouni, Rector of the University and Director, ONERSOL.

(c) Moussa Ladan, Chief of Service, Administration, and Finance, ONERSOL.

(d) François Veyretout, Volontaire du Progrès (France), ONERSOL staff.

(e) Harry Dorcus, Controller, USAID.

(f) Cameron Pippitt, Project Design and Evaluation Officer, USAID.

(g) Winfield Collins, Mission Engineer and Project Manager, USAID.

Unfortunately, the key personnel, Sidney Bliss, project manager during most of the life of the project, Dr. Warren Henry, U.S. consultant to the project, and Abdousalam Ba, responsible for the project during most of its life, had left the project and were not available to the evaluator.

Facilities and activities that were inspected are:

(a) ONERSOL laboratory - the R and D facility.

(b) ONERSOL FABRICATION - the production facility.

(c) Solar hot water heaters on individual houses and on the Hotel Gaweye.

(d) Solar thermodynamic irrigation pump at the Karma rice irrigation project.

FURTHER NOTE ON PROJECT EVALUATION

The Project Paper includes a section on evaluation procedures. It is reproduced here in its entirety:

" V. PROJECT EVALUATION PROCEDURES

In addition to the Social Impact studies to be carried out by IRSH during each of the two years of the project's lifetime, AID will finance visits to Niamey by approximately five American experts, who will lecture at ONERSOL, IRSH, and other interested organizations. ONERSOL has agreed that economists and anthropologists, as well as physical scientists, should be included in this program. In addition to their primary obligations, these experts will plan to report immediately to USAID/Niger and AID/W concerning their evaluation of the project. The first in-depth evaluation of the project is scheduled to take place in October 1979. A second and final evaluation will be held near the end of the two year life of the project, in mid-1980."

This evaluation procedure was not carried out. IRSH (Nigerien Institute for Research in Human Sciences) did not carry out the planned studies. None of the five American experts came to Niamey. The first in-depth evaluation scheduled for October 1979 was not done. The second and final evaluation scheduled for mid-1980 is to be identified with this evaluation done in September, 1982.

This absence of evaluation, especially during the early steps of the project, is a serious fault. A good evaluation at the scheduled times, October 1979 and mid-1980, would certainly have uncovered the absence of professional personnel and lack of R and D progress at an early stage and recommended corrective action. As it is, one can learn a valuable lesson from this: Evaluate at an early stage, even if it seems to be too early since that is the time to catch the things that aren't going properly and still have time to take corrective action.

15. External Factors

During the period of this project the professional staff of ONERSOL consisted of one Nigerien, Abdousalam Ba. Albert Wright, presently deputy director of ONERSOL, was in the U.S. pursuing his studies. Professor Moumouni, Director of ONERSOL, was and is pursuing his duties as Rector of the University. Mr. Ba left Niger recently to take up his duties with CRES (Regional Center for Solar Energy) in Ouagadougou, and eventually Bamako, and Albert Wright has returned from the U.S. to assume

his duties as deputy director of ONERSOL. Thus, there has been, and is, only one Nigerien engineer/scientist at ONERSOL. (A few French or other "cooperants" or "volontaires du progrès" rotate through ONERSOL).

In light of the paucity of engineer/scientists at ONERSOL it is evident that no program of development, transfer and adaption of technology can effectively occur. Thus, the five American technical assistants who were supposed to come to Niger, but did not, would have had almost no one to work with, the equipment bought under this project is idle, the building for which the project provided the architectural fee, is mostly empty, and the solar pumps which the project was to provide, but did not, would probably have remained in the shipping containers.

Two factors (external to this project) contribute to the paucity of scientist/engineering personnel at the laboratory. There are no technical institutes or engineering schools in Niger. The University does have mathematics, physics, chemistry, and biology departments. However, the total number of physics graduates for 1982 consisted of six degrees equivalent to bachelors and seven to masters. Of the 27 Nigerien students in training in the U.S. there are: sanitary engineering (2), electronic engineering (1) and meteorology (2). The rest are not in subjects satisfying ONERSOL needs. Information on Nigerien students in other countries was not available. We see therefore, that ONERSOL has a very meager reservoir from which to draw Nigerien engineer/scientists.

The second factor, external to this project, which makes it difficult to recruit and obtain qualified professional personnel at ONERSOL, is the salary structure. It is set by the government of Niger to be 2500 F CFA annually per point with points ranging from 0-1000, depending on a person's qualifications and position (at the University the range is 0-1600). The maximum pay is, therefore, about 208,000 CFA per month.* By contrast it was reported that Abdousalam Ba is receiving 500,000 CFA per month in his new job at CRES (which is higher than the Rector's salary) and that equivalent positions with Air Afrique or the Nigerien mining industry command salaries 2 to 4 times higher than ONERSOL can pay.

These two constraints, lack of trained Nigerien engineer/scientists and the comparatively low pay scale at ONERSOL, must be relieved if a program of solar technology development, adoption and transfer is to have a realistic chance of success. This evaluation recommends that USAID/Niger institute an in-depth study of training of scientific/engineering personnel at all levels in Niger. An adequate supply is necessary not only for progress in energy development but for progress in many other areas.

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* Approximately $600 per month.

16 and 17. Inputs and Outputs

The planned outputs are:

(a) Construction of a new ONERSOL laboratory building.

(b) Increased capacity of ONERSOL to do applied research on solar pumps. Operational applied research on solar pumps.

(c) Technically trained personnel.

Monies were to be provided by AID and the Government of Niger (GON) to five distinct inputs:

(a) Supervisory and architectural services for building construction to be provided by AID ($70,000). The remaining costs of construction were to be borne by GON ($1,300,000).

(b) Provision of equipment and instrumentation by AID ($186,000) and GON ($32,000).

(c) Provision of solar water pumps by AID ($65,000) and GON ($50,000).

(d) Provision of technical assistance by AID ($56,000).

(e) Training of ONERSOL personnel by AID ($63,000) and GON ($18,000).

In addition, AID provided a contingency fund of $60,000 which brought its total budget to $500,000.

INPUTS

The inputs were only partially provided and the outputs only partially occurred. Table I sets forth the funds planned and actually expended by AID. The funds expended by GON were not determined. However, GON provided on the order of $1,300,000 for construction of the building thus satisfying mandatory participation requirements.

(a) ONERSOL Building:

AID's contribution was well-spent. The building is functional, well-built and very attractive. It contains laboratory space, offices, library, shop space, a conference room, and living quarters for visiting workers or conferees. A notable feature: all offices, even the Director's are also laboratories which reveals an admirable intent to do hands-on work in addition to administrative and paper work.

(b) Equipment, instruments, vehicle:

The equipment which was ordered and received is housed in a closed, air-conditioned room. It has barely been unpacked, is still unused, and appears to be in good condition. A list of the equipment observed by the evaluator is given in Table II. The total value of the observed equipment, including the vehicle, appears to be about $100,000. Evidently, we did not track down all AID purchased items.

TABLE I. Niger Solar Energy Development (683-0235) Budget and Expenditures for Inputs/Outputs in Thousands of U.S. $

Project Inputs	Project Outputs			Budgeted	Expended
	ONERSOL facility constructed	Operational applied research in solar pumps	Advanced degrees & technical training		
AID					
Architectural and construction supervisory services	70			70	67.6
Equipment and instruments, vehicle		185.9		185.9	131.4
Water pumps		65		65	0
Technical assistance		56		56	4.8
Participant training			63	63	36.9
Inflation & contingencies				60.1	0
Totals:				$500,000	$240,712
Unexpended				$259,288	
Government of Niger					
Construction	1,300			1,300	Apparently all
Equipment instruments		31.8		31.8	Not determined
Water pumps		50		50	" "
Participant training			18	18	" "

This equipment, designed primarily for work on photovoltaic systems, cannot be effectively used as it presently stands. General electrical, electronic, mechanical, and laboratory equipment (parts, connectors, wiring, tools, etc) must be purchased. This was foreseen by an item called "miscellaneous additional instruments and parts, connections, shock mounting" in the budget for input (b). However, this item was not ordered or received. We recommended that this be done before closure of the project, otherwise, the room-full of valuable instruments that AID has supplied cannot be used. The budget for this item should be $10,000.

The budget item "books, periodicals, microfilm ($15,000)" was not supplied. This is a second item that should be supplied before closure of the project. A sum of $ 8,000 should be sufficient:

(c) Water Pumps:

The planned water pumps (2) were not ordered.

(d) Technical Assistance:

A small amount of technical assistance was supplied by Dr. Warren Henry in the U.S. Otherwise, none of the planned technical assistance, planned for Niger, was supplied.

(e) Training:

The project planned to send two Nigeriens to the U.S. for training. One person was to work toward a doctor's degree in engineering or physics, the second to train as a system's maintenance technician. Mr. Albert Wright, presently deputy director of ONERSOL, undertook the doctoral program. The technician training was not done.

Albert Wright went to the University of New Mexico in August, 1979 to study for the doctoral degree in mechanical engineering. He obtained the masters degree but did not pass the doctoral qualifying examination. Although he was granted permission to take it a second time, he decided to transfer to Howard University in Washington, D.C. where he did course work toward the doctor's degree in mechanical engineering in the spring semester of 1982. Obtaining the Ph.D., with work on a thesis, would have still taken four years. Mr Wright decided he could not devote that much time to it, and be separated from his family, and returned to Niger.

He did reasonable well in his work and could perhaps have obtained the Ph.D. He states that someone like him, however, is at quite a disadvantage in the American system. The French system is very different and it is difficult to adapt; there is, of course, a language difficulty and credits are not easily transferable from one system to the other. He could have avoided the few "C" grades he received if he had known how to drop a class at the right time (as the American students did). He indicated that he would hesitate recommending a similar excursion into the U.S. educational system for other Nigeriens.

TABLE II. Instruments and Equipment at ONERSOL Provided by AID Project Funds

1. Radiometer Control Unit, Eppley model 405

1. Radiometer, Eppley model HF

1. Speedomax G recorder, 165-250 series

1. Differential Potentiometer, L+N 7564

1. Resistance Thermometer Bridge, L + N 8064

1. Volt Potentiometer, L + N 8687

1. Linear Amplifier, L + N 9829

1. Digital Voltmeter, Fluke 8810A

1. Circuit Design Test System, Elite 2

1. Oscilloscope, Tektronix 7603 (with 2 amplifiers (7A16A) and dual time base (7B53A))

4. Precision Resistor, L + N (0.001, 0.01, 0.1, 1.0 ohms)

1. Oscilloscope, Tektronix OS - 245 (p)U (with 2 amplifiers (AM-6565/U) and 1 dual time base (TD-1085/U))

1. Set photovoltaic cells (approx. 1000 cells)

1. Oven, Fisher Isotemp model 2556

1. Calculator, HP 9825A (with 3 ROM's)

1. X - Y Plotter, HP 9872A

1. Printer, HP 9866B

OUTPUTS

(a) ONERSOL Laboratory Building: As described above this output was satisfactorily produced.

(b) Solar Pumps: During the period of this project no work on solar pumps was done at the laboratory. There are two pumps installed near Niamey, a 10 kW pump at Karma and a 1 kw pump at Bossey Bangou, which are maintained by two French engineers from the Atomic Energy Commission who are officed at ONERSOL. However, this work cannot be considered to be the operational applied research envisaged under the project (nor is it supported by project funds).

The second part of this planned output is an increased capacity, of ONERSOL, to carry out applied research on solar pumps (and other solar technologies). ONERSOL's capacity has been increased by (1) having a new building (2) having about $100,000 worth of new equipment and instruments and (3) three years of additional training for one person. However, the real objective - a trained, capable team actively and currently engaged in solar pump development and adaption, working with American technical assistants - was not attained. This is the major failure of the project.

(c) Trained Personnel: This output was only partially produced. A doctoral degree in mechanical engineering and a trained systems maintenance technician were planned. Actually produced was a master's degree in mechanical engineering.

18. Purpose

The project paper did not explicitly state a purpose. There was no "Logical Framework". However, implicitly stated, the purpose was "to assist ONERSOL to develop, test and apply solar energy technologies, especially for the benefit of Niger's rural poor". The emphasis was to be on solar water pumping. The project paper did not explicitly list "End of Project Status" (EOPS) items. It is quite clear that satisfactory attainment of the three major output items would constitute satisfactory EOPS. These are discussed under Inputs and Outputs, Section 16 and 17.

19. Goal/Subgoal

The project paper did not explicitly state a goal or subgoal. It did not contain a Logical Framework* However, the goal was implicitly stated to be the provision of solar water pumping to rural Niger. In order to accomplish this, the project was to set up ONERSOL in the business of development and installation of solar pumps. The progress toward this immediate goal, or purpose of the project, is discussed in Section 16 and 17, Inputs and Outputs.

20. Beneficiaries

The ultimate beneficiaries are the rural farmers who are to benefit from solar pumped water. However, since this project provides only the first of the two steps in the technology transfer process, namely transfer from the U.S. to ONERSOL, the beneficiary of concern is ONERSOL. ONERSOL benefitted by receiving (a) a new laboratory building, (b) instruments and equipments and (c) training for Albert Wright. However, the subtantial benefit envisaged in the project paper, namely, an active capable team of people working on solar pumping, was not realized.

The rural farmer, the ultimate beneficiary, has received no benefit at the present time. In order to provide solar pumping to him through ONERSOL, it will be necessary, as explained elsewhere, to solve the fundamental problem - lack of laboratory personnel (and the problem of technical personnel in Niger).

21. Unplanned Effects

There were no significant unplanned effects.

22. Lessons Learned

There is a major lesson that can be learned from this project. It is that it is extremely important to keep the evaluations and technical assistance on schedule. ONERSOL did not provide personnel (apparently only one Nigerien scientist/engineer, Abdousalam Ba, existed at ONERSOL during most of the period of the project) nor was there any activity in

* A.I.P. project papers do not require a Logical Framework.

solar pumping. Apparently AID did not notice this. An evaluation team or a technical assistant visiting in 1979 would have brought it to AID's attention at a time when corrective action could have been attempted. As it is, the main objective of the project, setting up an active competent solar pump team that should now be installing pumps in villages, has not been attained.

Furthermore, it is important to keep all activities moving on schedule. The miscellaneous equipment and library materials which are essential to the effective future operation of ONERSOL were not ordered. The solar pumps were not ordered. Materials for the mobile test unit are not on-site. Any of these deficiencies would have a severe impact on ONERSOL performance even if the personnel problem had not existed.

23. Special Comments or Remarks

This evaluation was carried out in Niger by Clarence F. Kooi, Energy Advisor, REDSO/WA from 31 August to 8 September, 1982.

24. Technology Transfer

The importance of technology transfer was emphasized in a recent cable from the Africa Bureau to all the African AID Missions and Regional Offices (STATE 191170). In this cable it was stated "The establishment of institutions which can develop, effectively transfer, and adapt technology are paramount". This project addressed itself to this subject. ONERSOL is an institution whose business is the development, adaptation and transfer of solar technologies to the Nigerien user. This project was designed to enhance ONERSOL's capacity to perform this function.

In the present case there are two steps in the process: (a) transfer of technology from the U.S. to ONERSOL, and (b) development, adaptation and transfer of technology by ONERSOL to the Nigerien user. This project is concerned with the first and with two parts of the second namely, development and adaptation of technology. This project addressed itself only marginally to the transfer of solar technologies from ONERSOL to the user.

The question posed in the recent cable (STATE 191170) concerning technology transfer are answered below. Since the cable assumed transfer directly to the user, and not through an intermediary such as ONERSOL, there are occasionally two answers, (a) and (b) corresponding to the steps (a) and (b) above.

I. Q. What constraint did the project attempt to relieve?

A. (a) This project is designed to relieve a labor constraint. Productivity, particularly of water and food, in rural areas is limited by lack of energy to apply to the productive process. For example, more energy is needed for irrigation water pumping, field work (tractors, oxen), and for fertilizers. Presently, this energy is composed mostly of work produced by human labor.

(b) With respect to ONERSOL the project attempts to relieve the constraint of inadequate buildings, equipment and personnel.

II. Q. What technology (knowledge, skills or practices) did the project promote to relieve this constraint?

A. This project is designed to promote renewable energies, for example, solar energy for water pumping or grain grinding.

III. Q. What technology did the project attempt to replace?

A. The renewable energy technologies which this project seeks to develop will partially replace human labor as applied to heavy mechanical work and in some cases will replace diesel or gasoline engine power.

IV. Q. Why did project planners believe that intended beneficiaries would adopt the proposed technology?

A. The project planners believed that the rural population would welcome energy sources which would supplement human labor both to increase production of water and food (and perhaps other necessities), to relieve labor constraints to food production, and to reduce heavy mechanical labor for both men and women. In many cases the costs of renewable energies are higher than the costs of conventional energies. However, in remote areas the cost of solar water pumping, for example, is expected to become equal to or less than the cost of diesel pumping by the end of the decade. This comparison is made because diesel pumping is now the most common supplement to human powered water raising in Niger.

V. Q. What characteristics did the intended beneficiaries exhibit that has relevance to their adopting the proposed technologies?

A. The Nigerien farmer feels very strongly his limitation in

procurement of both food and water. For example, the AID rural energy survey in Mali, a similar country, found that the farmer placed the highest priority on energy assistance in the food production and preparation process and in the water supply process. They are extremely receptive to help in these areas.

VI. Q. What adoption rate has this project achieved in transferring the proposed technology?

A. This project is designed to enhance the capabilities of the central solar energy laboratory. No technology was installed in that field. Therefore, an adoption rate cannot be given.

VII. Q. Has the project set forces in motion that will induce further exploration of the constraint and improvements of the technical package to overcome it?

A. No. Due to the lack of engineering/scientific personnel at ONERSOL, no progress was made along these lines.

VIII. Q. Do private input suppliers have an incentive to examine the constraint addressed by the project and to come up with solutions?

A. Yes, in the domain of diesel power, water pumping, agricultural inputs, etc. The situation is less clear concerning renewable energy inputs. However, "ONERSOL FABRICATION", the manufacturing branch of ONERSOL, intends to become a mixed society, 51 percent government owned and 49 percent owned by others, including private organizations. It is intended to involve private enterprise in the process.

IX. Q. What delivery system did the project employ to transfer technology to intended beneficiaries?

A. The project did not transfer technology to the beneficiaries. The project was designed to transfer technology to an intermediary, namely, ONERSOL. The delivery system consisted of the inputs (1) assistance with building construction, (2) provision of instruments, equipment and solar pumps, and (3) technical assistance and training.

X. Q. What training techniques did the project use to develop the delivery system?

A. The project intended a broad range of training; both training of Nigeriens in the U.S. and training in Niger by the American technical assistants. However, only one instance of training occured - an ONERSOL scientist obtained a masters degree in mechanical engineering in the U.S.

XI. Q. What effect did the transferred technology have upon those impacted by it?

A. There was essentially no transfer of technology under this project. This was due to the absence of appropriate personnel at ONERSOL to whom the technology was to be transferred.

25. Recommendations

The evaluation makes the following recommendations:

(a) Due to the lack of qualified Nigerien scientists/ engineers (only Mr. Wright at the moment) at ONERSOL, it would not be productive to extend the project. Therefore, it is recommended that the project not be extended but that the two general items listed below be purchased from the present budget before de-obligating the remaining funds.

(b) Nearly $100,000 worth of instruments and laboratory equipment has been purchased by the project for ONERSOL. However, the "miscellaneous" item consisting of all the tools, wires, connectors, electronic, electrical and mechanical small equipment necessary to make these instruments useful was not ordered. We recommend that it be ordered. The instruments and major equipment cannot be used without these small items. We recommend a budget of $10,000 for this purchase.

(c) A spacious library room has been provided in the ONERSOL facilities. However, none of the library materials budgeted under this project was purchased. Inspection showed that books and journal subscriptions are seriously lacking. Therefore it is recommended that, in order to bring the library up to reasonable standards for a facility such as ONERSOL, a budget of $ 8,000 be provided from presently obligated funds to purchase the required books and subscriptions.

(d) This project planned to supply two solar pumps to ONERSOL. Difficulties with procurement, price and waivers (for American solar cells on a French pump) were encountered and pumps were not ordered. There is now a small off-the-shelf American photovoltaic pump available for about $9,000. It will fit ONERSOL's needs admirably. In particular, it can be installed at the Karma rice irrigation project so that comparative performance with three other pumps, a large diesel pump, a small Lister diesel pump, and a 10 kW solar thermodynamic pump, can be observed and measured. This comparative study can be done effectively even with the presently limited ONERSOL staff. It would include a study of technical, operational and cost factors. We recommend that $10,000 be set aside for purchase and shipment of this pump to ONERSOL. There are no installation costs. Since the pump is portable it can be moved and used at other locations and for other purposes after this study is finished.

(e) The serious lack of trained technical personnel, particularly engineers and scientists, was implicated in the failure of this project to attain its major objective. Therefore, it is recommended that AID undertake a thorough study of technical engineering, and scientific training in Niger with a view toward taking action that would increase the numbers of qualified Nigeriens available to projects such as the present project. It appears that all developments of a scientific, engineering and technical nature in Niger will be seriously crippled if this constraint is not removed. The money for this study would be provided from other than present project funds.

Implementation of Recommendations (b) and (c)

In order to make the purchases of the miscellaneous laboratory equipment (recommendation (b)), it will be necessary to prepare a specific list with supplier, catalogue number, and price. This can best be done with help from the Solar Energy Project in Bamako where they have gone through this identical exercise. We recommend that N'To Diarra chief of the photovoltaic branch or Terry Hart, energy advisor, come to Niamey and, in cooperation with Albert Wright, prepare the list.

The same procedure should be followed for preparing the list of library materials (recommendation (c)). The Solar Energy Laboratory in Bamako has already done the job and now has a good library. A visit from their full-time librarian, M. Ankoumbe SOKANDA, is in order. He could assist Mr. Wright in preparing the list and in instituting an appropriate library system.

These visits should be simultaneous since Diarra or Hart would be of considerable assistance to the library effort. The visits should be to Niamey and not, for example, by Albert Wright to Bamako, since it is important to observe the existing equipment, instruments and library materials at ONERSOL.

The solar pump is manufactured and sold by Solar Electric International, 9 Whittier Road, Lexington, Mass. 02173, tel. (617)862-2799. Literature is attached. It is said that a more powerful model is also available from this company.

Solar Electric International

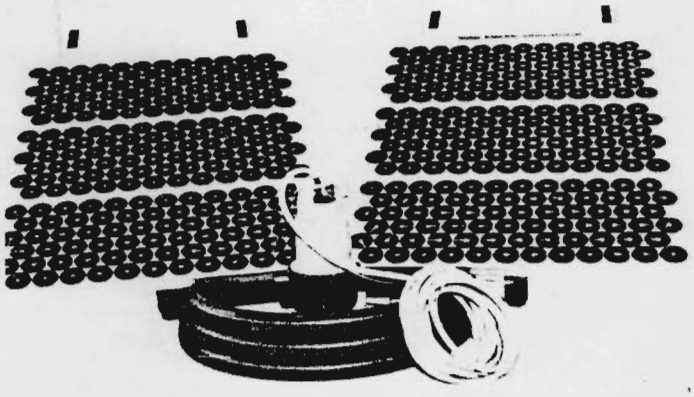
Subsidiary of Applied Solar Energy Corporation

SEI-250M Portable Sun Pump

CONCEPT

Over 50 million of the world's poorest farm families exist on less than 50 million hectares (125 million acres) in the fertile alluvial valleys, deltas and coastal plains of the Third World. Most of these areas experience extended dry seasons during which cropping is impossible without irrigation; but adequate irrigation is frequently either unavailable or beyond the financial means of a small farmer.

SEI Sun Pumps are solar-powered water pumping systems which can dramatically alter the irrigation options open to these farmers. The units are specifically designed to supply irrigation water to farms of 1 to 4 ha., depending upon lift and cropping pattern, where conventional methods are either inappropriate or becoming prohibitively expensive. In addition, SEI Sun Pumps can be used for stock watering in remote locations and as a component of village and other rural water-supply systems.



SEI-250M Sun Pump

DESCRIPTION

The Sun Pump available today is the SEI-250M model; a lightweight, self-contained system designed to deliver 2.5 liters/second at a lift of 5 meters. (See graph on reverse side for indicative performance.) The unit comprises a 250 watt photovoltaic array, submersible pumpset and a portable mounting frame. The entire apparatus can be easily moved from house to field, or from one water source to another. The simple operation and low maintenance of the Sun Pump make it particularly well suited for use in rural areas and in those places not served by an electric grid.

SEI is in the process of developing a modular "family" of solar powered micropumps to cover the range of lifts and discharges likely to be economic for irrigation applications in the immediate future. The full range is expected to be available by early 1982.

OPERATION AND MAINTENANCE

The SEI-250 Sun Pump is quiet, safe and simple to operate. The user merely places the array in the proper sun-facing direction, lowers the pumpset into a well or canal, and switches the unit on. If he does not intend to move the Sun Pump daily he leaves the swtich on; the unit will automatically turn on and off as the sun rises and sets. Additional daily discharge is obtainable by repositioning the array manually three or four times a day to face the sun.

Routine maintenance involves occasional water rinsing to remove any accumulated dust or dirt. The array should have a trouble-free lifetime of 15 years, while the pumpset is designed for 15,000 hours of maintenance-free operation.

FEATURES

ARRAY

Rugged, high-reliability, easily maintained.
Outer surface protected by high transmittance tempered glass.

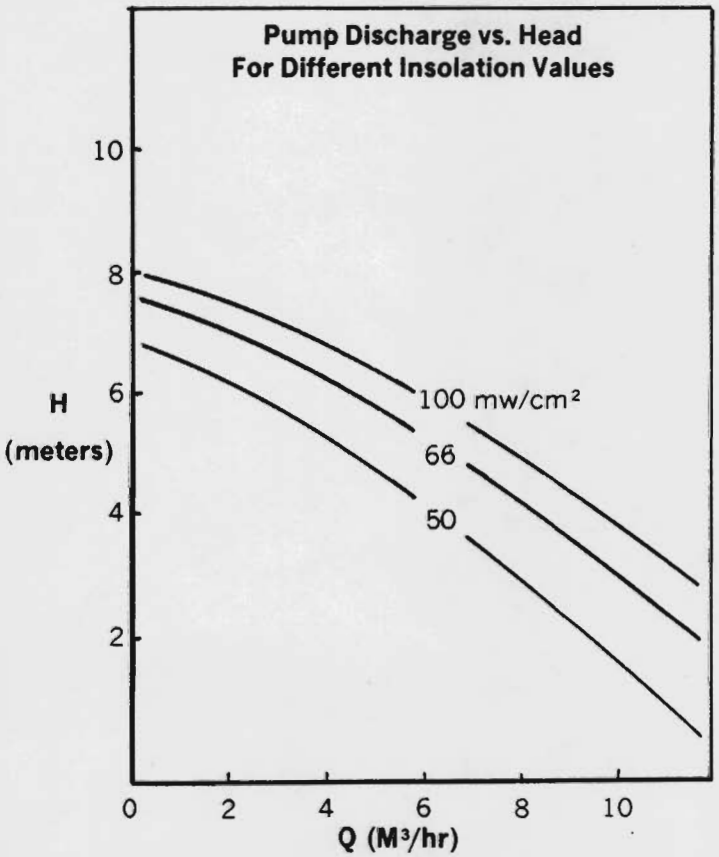
PUMPSET

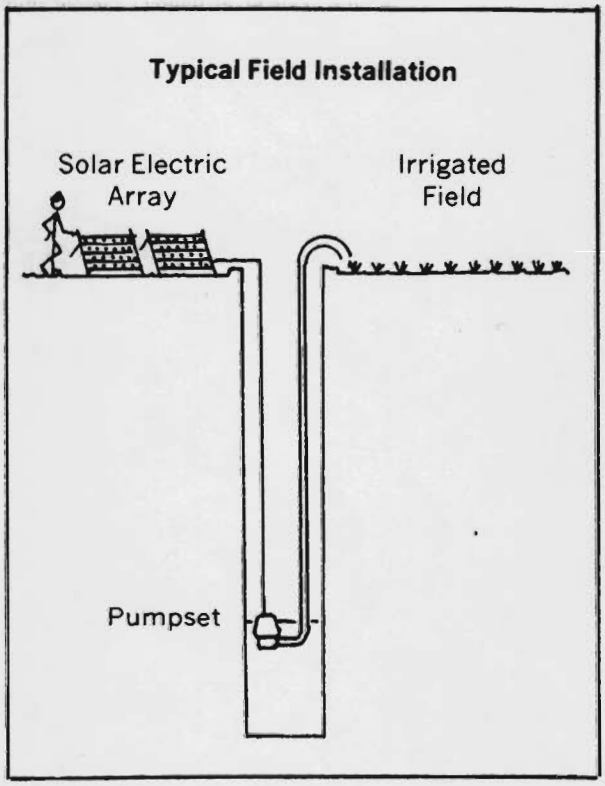
Submersible, high efficiency variable voltage/variable speed.
Nominal operation 3000 RPM at 60 Volts DC.
Brushless, permanent magnet design eliminates need to unseal motor for periodic maintenance.
Vertical axis, single-stage centrifugal pump close-coupled to motor.
High impact plastic impeller and glass reinforced plastic casing.
Optimized for high-flow, low-head, canal and open well conditions.

FRAME

Sturdy frame supports the array, allows proper orientation to the sun and facilitates transportation of unit.

INDICATIVE PERFORMANCE





Solar Electric International

LOS ANGELES
15703 East Valley Boulevard
P.O. Box 1212, City of Industry
California 91749
(213) 968-6581
TWX 910-584-4890

WASHINGTON
4837 Del Ray Avenue
Bethesda
Maryland 20014
(301) 656-9614
Telex: 248491 SEIW

LONDON
621 London Road
High Wycombe
Bucks., HP11 1ET
(0494) 452497
Telex: 83239 OCLI