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AUDIT OF  
MICRO/MINI HYDROELECTRIC PROJECT  
USAID/THAILAND  
PROJECT NO. 493-0374

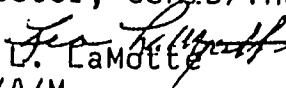
Audit Report No. 2-493-88-03  
February 17, 1988

UNITED STATES GOVERNMENT

# Memorandum

TO: Dr. John R. Eriksson  
Director, USAID/Thailand

DATE: February 17, 1988  
RIG/EA-88-130

FROM: Leo L. LaMotte   
RIG/A/M

SUBJECT: Audit Report No. 2-493-88-03  
Audit Report of the USAID/Thailand's Micro/Mini  
Hydroelectric, Project No. 493-0374

The Office of the Regional Inspector General for Audit/Manila has completed its audit of the Micro/Mini Hydroelectric Project No. 493-0374. Five copies of the audit report are enclosed for your action.

The report contains two recommendations for your resolution. Please provide written notice within 30 days of any additional information related to the actions planned or taken to implement these recommendations.

I appreciate the cooperation and courtesy extended to my staff during the audit.

## EXECUTIVE SUMMARY

The purpose of the Micro/Mini Hydroelectric Project in Thailand was to develop an analytical capacity and method which would permit the Royal Thai Government to improve small hydroelectric system planning, analysis, construction techniques and procedures and to design and construct up to 12 micro/mini hydroelectric generating systems. The project paper defines a micro electric generating plant as one that can produce 1 - 100 kilowatts of electricity, while a mini plant can produce 100 - 1000 kilowatts of electricity. The project was viewed as a crucial starting point for Thailand's small hydroelectric program. It was envisioned that 100 small hydroelectric sites could be constructed in Thailand. During implementation the project was changed to building no sites with 1-100 kilowatts of generating capacity and the total number of sites dropped from 12 to eight, six sites with capacity of 500 to 958 kilowatts and two sites exceeding the 1000 kilowatt range.

The project was a \$12.8 million joint effort by A.I.D. and the Royal Thai Government. A.I.D. provided \$8.0 million in loan funds at standard terms of 40 years, and a \$100,000 grant to cover evaluation requirements. The Royal Thai Government's share was \$4.7 million. The loan agreement was signed on September 16, 1982 with the project assistance completion date scheduled for September 1987. By December 31, 1986, A.I.D. expenditures for project activities were \$1.95 million.

This was primarily a program results audit. The specific objectives of the audit were to determine whether (1) project objectives would be achieved, (2) project accomplishments would be long lasting (institutionalized), and (3) management monitoring practices were adequate.

The Micro/Mini Hydroelectric Project will provide hydroelectric energy to many areas in Thailand making the country less dependent on fossil fuels. Thus one purpose of the Project will be achieved. However, USAID/Thailand had not fully documented how institutional development would occur, especially sustainability. In addition, project monitoring should be improved, primarily the documentation of monitoring activities.

A.I.D. policy defines institutional development as an important factor that must be considered in project design and implementation, especially for renewable energy projects. Numerous changes have been made to project design and it is uncertain whether Agency institutional development objectives were being achieved. This occurred because the

institutional development concepts in the project design were not fully adhered to nor was the impact of the changes, as they pertained to institutionalization, documented by A.I.D. or the Royal Thai Government.' As a result, over \$8 million in loan and grant funds were being spent without assurance that developmental benefits would be long lasting.

We recommended that USAID/Thailand document with specificity what now constitutes adequate technological institutional development for this project to ensure its long lasting effect. USAID/Thailand responded that much of the planned institutional development has progressed satisfactorily through the technology transfer achieved during construction of six of the 8 hydropower systems underway at the time of audit although the USAID agreed that there has been a high turnover of trained project staff.

USAID/Thailand's response explained several aspects of the project and gave reasons for changes which were not readily available during the audit. The report has been revised accordingly. However, the Regional Inspector General's position continues to be that it is necessary for any changes in project design and implementation to be documented as they occur because such documentation is necessary for managerial evaluation and is beneficial to any new managers. Also, what constitutes an adequate level of institutional development as a result of the changes needs to be documented and approved, including the number of trained staff to be dedicated to hydroelectric activities in the government, the turnover of the facilities and the source of budgeting for operation and maintenance. The implementation of the updated institutional development requirements also needs to be verified. In this regard we found USAID/Thailand's documentation to be inadequate. A similar lack of documentation was reported in other audits of USAID/Thailand, for instance in the Audit of Mae Chaem Watershed Development Project, Audit Report No. 2-493-86-04 issued May 26, 1986 and the Audit of USAID/Thailand's Project Management Information System, Audit Report No. 2-493-88-01 issued October 30, 1987.

A.I.D. regulations require USAIDs to establish project monitoring and evaluation plans for all projects. The Micro/Mini Hydroelectric Project was not adequately monitored by USAID/Thailand. This occurred because USAID/Thailand did not implement an effective project monitoring system nor did it adequately document monitoring activities. As a result, USAID/Thailand was not fully aware of the actual status of project activities and of the project's success in meeting A.I.D.'s development and project objectives. We recommended that USAID/Thailand

improve its monitoring procedures and activities to provide effective project monitoring over the remaining life of project activities. USAID/Thailand agreed that project monitoring could be improved and better documented.

*Office of the Inspector General*

AUDIT OF  
MICRO/MINI HYDROELECTRIC PROJECT  
USAID/THAILAND

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AUDIT OF  
MICRO/MINI HYDROELECTRIC PROJECT  
USAID/THAILAND

PART I - INTRODUCTION

A. Background

The purpose of the Micro/Mini Hydroelectric Project in Thailand was to develop an analytical capacity and method which would permit the Royal Thai Government (RTG) to improve small hydroelectric system planning, analysis, construction techniques and procedures and to design and construct up to 12 micro/mini hydroelectric generating systems. The project paper defines a micro electric generating plant as one that can produce 1 - 100 kilowatts of electricity, while a mini plant can produce 100 - 1000 kilowatts of electricity. The project was viewed as a crucial starting point for Thailand's small hydroelectric program. It was envisioned that 100 small hydroelectric sites could be constructed in Thailand. During implementation the project was changed to building no sites with 1-100 kilowatts of generating capacity and the total number of sites dropped from 12 to eight, six sites with capacity of 500 to 958 kilowatts and two sites exceeding the 1000 kilowatt range.

The Micro/Mini Hydroelectric Project (493-0374) owes its genesis to the design and initiation of the Renewable Nonconventional Energy Project (493-0304). This project apparently had success in constructing micro hydroelectric sites. Under the Renewable Nonconventional Energy Project, four hydroelectric systems (all under 200 kilowatts) were constructed. A.I.D. believed the total national and village benefits appeared quite positive for replication of micro/mini hydroelectric sites.

The Project was a \$12.8 million joint effort by A.I.D. and the RTG. A.I.D. provided \$8.0 million in loan funds at standard terms of 40 years, and \$100,000 in grant funds to cover A.I.D. evaluation requirements. The RTG share was projected at \$4.7 million. The loan agreement was signed on September 16, 1982 with a project completion date scheduled for September 1987. USAID/Thailand plans to extend the project completion date by two years. By December 31, 1986, A.I.D. expenditures for project activities were \$1.95 million.

In September 1982, A.I.D. and the RTG signed the Micro/Mini Hydroelectric Project (493-0374) loan agreement aimed at systematically developing options to reduce Thailand's dependence on fossil fuels for electrical energy generation

through the development of economically attractive indigenous micro/mini hydropower resources. It was envisioned that one hundred small hydroelectric sites could be constructed in Thailand.

Reimbursement of costs was to be made using the Fixed Amount Reimbursement Agreement method. A.I.D. would reimburse the RTG up to 50 percent of the cost of civil works construction, including equipment installation and necessary power transmission and distribution lines, and 100 percent of the costs of power plant equipment. The fixed costs were to be established using the actual contract award amounts.

Two RTG agencies were involved in the project and two others would be involved once the power plants were operational. The National Energy Administration was responsible for the overall project implementation. The National Economic Science Development Board was responsible for coordinating study results and analysis so as to maximize the utility and impact of project activities. The Energy Generating Authority of Thailand would assume responsibility for operation and maintenance of the power plants while the Provincial Electricity Authority would assume responsibility for electrical distribution to users.

## B. Audit Objectives and Scope

This was primarily a program results audit. The specific objectives of the audit were to determine whether (1) project objectives would be achieved, (2) project accomplishments would be long lasting (institutionalization), and (3) management monitoring practices were adequate. We did not review actual expenditures for construction of the hydroelectric sites because under the Fixed Amount Reimbursement Agreement (FARA), the Royal Thai Government (RTG) initially provides all the funding for construction. Reimbursement would be made by A.I.D. as each site was completed. None of the sites had been completed at the time of our audit.

The audit work was conducted at USAID/Thailand who had overall management responsibility for the project. The audit included reviews of project files and records maintained at USAID/Thailand. Review of accounting records, financial statements, periodic progress reports and other pertinent records was made to assess project progress. Also reviewed were final reports provided under a professional services contract with the Association of Team Consulting Engineers Co., Ltd., K Engineering Consultants Co., Ltd., and Stanley Consultant, Inc.. These reports contained the financial feasibility, socio-economic, and environmental impact analysis performed on the first three sub-projects currently under construction. Interviews were held with USAID/Thailand engineers and personnel participating in the project.

The information needed from RTG officials was obtained by the auditors after preparing all pertinent questions required for completion of the analysis of project activities. Meetings were held with the RTG Project Director and other key RTG officials including the Deputy Secretary General of the National Energy Administration (NEA), the agency responsible for implementing the project, and other members of the NEA staff.

The audit was performed in USAID/Thailand during the period October 1986 to April 1987. It was made in accordance with generally accepted government auditing standards. Internal controls and compliance work was limited to findings discussed in the report.

AUDIT OF  
MICRO/MINI HYDROELECTRIC PROJECT  
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PART II - RESULTS OF AUDIT

This audit was made to determine whether project objectives would be achieved, whether project accomplishment would be long lasting and if management monitoring practices were adequate. The audit showed that numerous changes had been made to project design and it was uncertain whether Agency institutional development objectives were being achieved. Further, the project was not adequately monitored by USAID/Thailand nor did it adequately document monitoring activities.

The Micro/Mini Hydroelectric Project will have provided hydroelectric energy to many areas in Thailand making Thailand less dependent on fossil fuels. Thus one purpose of the Project will have been achieved.

The auditors noted that numerous changes to project design had been made during project implementation. These changes were reflected in the number and type of hydroelectric projects to be constructed, the cost of each sub-project and the time frame during which the project was to be built. The auditors also noted that institutionalization, a very important component of the project design, had not been readdressed after the changes had been made. In addition, management actions with respect to the changes had not been documented.

USAID/Thailand did not follow Agency monitoring criteria by not adequately documenting management monitoring practices. Project progress reports were not being submitted as required and site visits were not documented for management use.

We recommend that USAID/Thailand specifically identify those changes that prevent institutionalization from being implemented in a manner consistent with project planning documents and readdress whether the impact of such changes are in accordance with agency policy. All changes should be approved and documented. Monitoring procedures should be documented and implemented over the remaining life of project activities.

## A. Findings and Recommendations

### 1. Project Institutional Development Objectives May No Longer Be Consistent With Agency Development Policy

A.I.D. policy defines institutional development as an important factor that must be considered in project design and implementation, especially for renewable energy projects. Numerous changes have been made to project design and it is uncertain whether Agency institutional development objectives were being achieved. This occurred because the institutional development concepts in the project design were not fully adhered to nor was the impact of the changes, as they pertained to institutionalization, documented by A.I.D. or the Royal Thai Government (RTG). As a result, over \$8 million in loan and grant funds were being spent without assurance that developmental benefits would be long lasting.

#### Recommendation No. 1

We recommend that USAID/Thailand specifically document what now constitutes adequate technological institutional development for this project in accordance with agency policy. This action should ensure the long lasting effect of institutional development.

#### Discussion

A.I.D. policy states that institutional development is an important factor that must be considered in project design and implementation, especially for renewable energy projects. Institutionalization is essential for providing a country the self-sustaining capacity to solve critical development problems. An effective institution is one in which host country resources will foster development that can be sustained after external assistance is withdrawn. A.I.D. has viewed institutional development as an important element of its development assistance program for many years. For instance, the A.I.D. Policy Paper on Institutional Development <sup>1/</sup> focuses on the idea that A.I.D.'s institutional development effort will be directed at improving the policies and procedures of key recipient country organizations. The policy paper noted that institutional development should encourage the development of institutions by building effective information handling systems and strong analytic capacities, and it should provide for the active participation of clientele in the

<sup>1/</sup> A.I.D. Policy Paper Institutional Development, dated March 1983.

design, implementation and evaluation of field programs.

### Institutional Development

Numerous changes had been made in project design and it is uncertain whether Agency institutional development objectives were being achieved. This occurred because many of the institutional development concepts in the project design were not fully adhered to nor was the impact of the changes, as they pertained to institutionalization, documented by A.I.D. or the RTG. These changes were reflected in the number and type of hydroelectric projects to be constructed, the cost of each sub-project, the time-frames during which the project was to be built, and the establishment and operation of a Project Operations Unit (POU). Project documents also did not fully address project continuation after withdrawal of external assistance.

As the following table shows, eight mini hydroelectric sites and no micro sites were planned to be constructed instead of the twelve combination micro/mini sites initially planned.

<u>Project Site</u>	<u>No. of Kilowatts</u>	<u>Type of Site</u>
Nam Mae Hat <u>1/</u>	818	Mini
Huai Lam Sin <u>1/</u>	958	Mini
Khlong Lam Plok <u>1/</u>	1,182	Exceeds Mini
Lam Pra Plreng <u>2/</u>	850	Mini
Nam Kha Mun <u>2/</u>	1,030	Mini
Khlong Duson <u>2/</u>	680	Exceeds Mini
Nam Ya Mo <u>3/</u>	500	Mini
Nam Mae Sot <u>3/</u>	660	Mini

1/ Only Nam Mae Hat, Huai Lam Sin and Khlong Lam Plok sites were under construction.

2/ Construction bids had been offered on the Lam Pra Plreng, Nam Kha Mun and Khlong Duson sites.

3/ The Nam Ya Mo and Nam Mae Sot sites were still in the design phase.

Construction activity under the Micro/Mini Hydroelectric Project has been concentrated in the upper mini range of 1000 kilowatts with two sites exceeding the 1000 kilowatts mini limit. The National Energy Administration (NEA) has defined the mini hydroelectric site size differently from the project. While the project paper defines a mini site as not exceeding 1,000 kilowatts in electrical output, NEA considers up to 6,000 kilowatts in output as a mini site.

Institutional development may be limited because only eight hydroelectric sites will have been built. It was anticipated in the planning documents that a minimum of 10 to 15 sites would be essential to provide a reliable data base. Construction of the first six sites was scheduled to commence in 1983. The second six sites were planned for construction beginning in 1984. After almost four years of project implementation only three sites have progressed to the construction phase.

Construction has also been unusually slow for the three sites under construction. It was anticipated that the first six sites would be constructed and completed by late 1984 or early 1985. Instead, according to NEA officials, construction of the three sites was only about 20 per cent complete at the end of 1986 and none of the first three sites under construction will be operational before May 1988. The project completion date will probably have to be extended at least two years for completion of all site construction work.

Most of the delays were caused by problems associated with contract negotiations and conflicts over contract specifications and scope of work sections. In addition, many of the work schedules were considered unrealistic in terms of time and other unforeseen factors. For example, while the contract for the Khlong Lam Plok site was awarded in September 1985, construction work could not begin until January because of monsoon rains and disputes between two villages over division of labor.

The hydroelectric sites actually being constructed under project funds were also more costly than provided for in planning documents. For example, it was originally anticipated that the first six sites would cost about \$2.6 million or an average of \$433,000 per site. The actual cost of the first six sites under construction will be about \$8.45 million or about \$1.41 million per site.

According to USAID/Thailand officials, this occurred because the original estimates were only rough figures and were primarily based on estimates for smaller facilities than those being constructed. They further noted the actual cost

was to be determined as the project was implemented and appropriate facilities were designed using a site selection model developed under the project. Also, because the sites were larger, the cost per kilowatt of electricity for the sites constructed under the project was expected to be about half the cost per kilowatt for the six sites identified in the project paper.

The Micro/Mini Hydroelectric project paper specifically highlighted the need for institutionalization by formulating a project design that would specialize in conveying the results of project analyses to those RTG personnel and organizations most likely to make use of the information. The project paper called for institutional development to be achieved through (1) the creation of a POU for data collection and analysis and (2) the construction of up to 12 micro/mini hydroelectric sites which would provide the basis for the collectible data. The POU was to be under the direct supervision of the NEA Deputy Secretary General and was to be accorded a high priority for the development of the small hydroelectric sector and for ensuring maximum institutionalization of project results. Specifically, the POU was to be involved in the collection of existing data on Thai and foreign experience in the micro/mini hydro section; it was to be responsible for proposing and directly implementing project funded analysis, planning construction and operations; and it was to be responsible for the systematic monitoring and evaluation of field activities undertaken by the Project.

The creation of the POU was a condition precedent to the loan agreement and NEA initially satisfied the condition by formally assigning 12 officials to the POU in September 1982. The RTG, however, never fully provided the resources necessary to carry out the POU functions even though those functions which were specifically identified in the loan and grant agreement were considered essential to the success of the project.

According to a January 1986 Technical Assistance Report 2/, senior NEA staff were not assigned full-time and the full-time staff who were actually appointed were junior engineers. The report noted that these engineers lacked experience or authority to implement the institutional development aspect of the project. In addition, the POU staff who were assigned to the project were carrying out project activities only on a part-time basis. Therefore, it was difficult for them to devote time to the Micro/Mini

2/ Micro/Mini Hydroelectric Project, Part B Services Technical Assistance, Volume 11, January 1986.

Hydroelectric Project on a priority basis. As a result, it often took the POU staff months instead of weeks to review and approve documents. In fact, the problem became so acute that in December 1983 the USAID/Thailand Director informed NEA that A.I.D. would deobligate the loan if the POU and Ministry of Finance continued with the lengthy delays and lack of sound progress.

At the time the loan agreement was signed, NEA indicated that eight full-time staff and 11 specialists as required would be assigned to the POU. At the time of this audit, the POU had only five full-time employees. A NEA official indicated that over 50 different employees had been assigned at different times to work on the Micro/Mini Project as the needs required. Their first priority, however, was with NEA. Essentially, institutional development activities provided by the POU consisted of day-to-day data collection and monitoring of construction activities and establishing dialogue with USAID/Thailand. USAID/Thailand officials told us that the POU was not necessarily the only or the best way to achieve the institutional development objectives and that the knowledge obtained by NEA employees in general may have been as good or a better approach. However, if so, those facts should have been verified and documented in a plan for achieving institutional development.

Another important aspect of institutionalization was that host country resources would eventually be used to foster development and provide for project continuation after withdrawal of external assistance. The only reference to sustainability in project planning documents was that one RTG Agency would assume responsibility for operation and maintenance of the power plants once construction was complete and another Agency would be responsible for electrical distribution to users. We were told that it was premature for A.I.D. to have a plan for turning over the facilities to the government as construction of any one site had not been completed. Consequently, project funds were being spent without assurance that developmental benefits would be long lasting. A more definitive plan for project sustainability should be developed.

#### Management Comments

USAID/Thailand disagreed with our position regarding institutional development and believed institutional development had occurred consistent with project planning documents. They contended that the fact that several key elements of project design initially considered essential for institutional development were not implemented as planned does not establish the premise that institutional development had not or would not occur. For example, they

acknowledged that 1) only eight hydropower systems would be constructed, rather than twelve as estimated in the project paper and 2) that the POU was not staffed as planned and that turn-over had been a major problem. In fact, USAID/Thailand contended that the project was not designed to impose permanently on NEA a particular institutional structure for hydropower analytical capabilities, but rather the project was to provide a means for focusing NEA on the hydroelectric sector.

In short, USAID/Thailand believed that institutional development had occurred, not as ideally as would have been the case in the absence of staff turnover, but with significant positive impact on the on-going efforts of NEA in developing hydropower resources. They state that the POU performed its intended function, was scaled back following completion of the bulk of its work, and that the technicians trained can still use their expertise in other units where they are assigned.

#### Office of Inspector General Comments

Naturally it is expected that there will be changes in a project as it goes along because everything can not be visualized in the design stages. Significant revisions to this report were made because management comments adequately explained a number of aspects not readily available for auditor analysis at the time of the audit. However, management comments do not explain why institutional development objective changes were not documented nor do they show what the specific institutional development objectives currently were. The RIG/A/M believes it is necessary for any changes in design objectives (including institutional development objectives) to be documented as they occur in order for management to effectively review project implementation and policies and to decide whether these policies and implementation efforts are meeting the revised objectives. Changes in objectives, implementation activities and policies are not only important to evaluate the current status of project implementation but are essential particularly for the benefit of any new managers.

The various modifications to the design of the project discussed in USAID/Thailand's response may very well have been the reasons why project objectives (including institutional development objectives) were changed and the changes may very well have been necessary to the project's success. However, the revisions were not documented and the reasons for making the revisions were not documented. In addition, USAID/Thailand comments, while providing a broad explanation of actions taken, do not provide enough specific information, particularly in the area of institutional

development, for current or succeeding project managers to assess whether institutional development is taking place in accordance with A.I.D. Policy.

For example, the project paper design documents made the establishment of the POU technical division a condition precedent to implementation of the project. After the project began we could locate no documentation justifying or even acknowledging this unit's demise until we received management comments to this audit report. Similarly, USAID/Thailand's comments describe a number of people being trained in hydroelectric technology, however, there is no evidence to show how many of these staff remain at NEA or whether they are in positions where they can use the knowledge they acquired from the hydroelectric training. USAID/Thailand seems to conclude that whatever happens incidentally is good enough if some residual positive results are obtained. The Regional Inspector General's Office believes that managerial accountability requires that when changes in objectives are made, the changes should be documented, evaluated, justified and approved at the time they are made. At that time it should be clear to all responsible managers that the project design remains viable, useful and in accordance with A.I.D. policies such as institutional development and that current specific goals, objectives and milestones are established with which to compare actual implementation. A subsequent historical document of what has transpired is not adequate for day to day management and if managers are reassigned, it is essential that new managers have ready access to such documentation. RIG/A/Manila has explained these requirements in other project audits of USAID/Thailand, including our report on the Mae Chaem project and our recent report on USAID/Thailand's project information systems.

The Audit of Mae Chaem Watershed Development Project, Audit Report No. 2-493-86-04 issued May 26, 1986, stated on page 10, last paragraph:

"Project objectives and goals should be stated in the Project Paper in such quantifiable, measurable terms as possible; milestones should be established and these objectives and goals critical to project success should be identified. As the project is implemented, the project may be redirected (reduced, increased or changed) for various reasons, including as a result of recommendations of a project evaluation team. Nevertheless, the reasons for any changes should be fully documented. A current statement of objectives and goals should always be readily available in quantifiable, measurable terms with milestones.

Also, those goals and objectives critical to project success should be identified."

The Audit of USAID/Thailand's Project Management Information System, Audit Report No. 2-493-88-01 issued October 30, 1987, stated on page 2, paragraph 4:

"However, USAID/Thailand had not mandated a project management information system which established specific responsibilities and requirements. Therefore, little information was available for many projects as to specifics of project implementation, progress against plans and achievement of project objectives. We recommended that specific responsibilities and guidance for project monitoring and information systems be established and management information systems for projects which measure and report progress against plans and achievement of objectives be enforced."

We believe at a minimum USAID/Thailand should document with specificity what is an adequate level of institutional development in accordance with A.I.D. institutional development policy and then monitor and document the extent to which it has actually taken place.

## 2. Effective Project Monitoring System Was Not Implemented

A.I.D. regulations require USAID's to establish project monitoring and evaluation plans for all their projects. The Micro/Mini Hydroelectric Project was not adequately monitored by USAID/Thailand. This occurred because USAID/Thailand did not implement an effective project monitoring system nor did it adequately document monitoring activities. As a result, USAID/Thailand was not fully aware of the actual status of project activities and of the project's success in meeting A.I.D.'s development and project objectives.

### Recommendation No. 2

We recommend that USAID/Thailand improve project monitoring procedures and activities over the remaining life of the project, especially the documentation and analysis of management actions taken.

### Discussion

A.I.D. regulations require USAID's to establish project monitoring and evaluation plans for all their projects. A.I.D. Handbook 3 sets forth responsibilities for managing and monitoring projects. Chapter 11 specifically requires that progress be compared to plans to alert management to potential implementation problems and requires timely gathering of information on inputs, problems and actions critical to project success. Chapter 12 specifies that monitoring efforts should be concerned not only with timeframe events occurring as planned, but also with the continued likelihood that the project will achieve its purpose. In addition, the loan and grant agreement require the RTG to establish a program evaluation plan within the first six months of the project. The program evaluation was intended to determine the degree of attainment of project objectives, to identify and evaluate problem areas, to provide solutions thereto and to evaluate project impact.

The Micro/Mini Hydroelectric Project was not adequately monitored because USAID/Thailand did not implement an effective project monitoring system, nor adequately document monitoring activities.

USAID/Thailand did not follow established monitoring criteria stated in A.I.D. Handbook 3. For instance, the quarterly implementation status reports did not contain adequate or factual information about the project's overall progress. These reports cited that the project had been moving smoothly despite the numerous delays encountered with design, site selection, and the operational activity of the

Project Operations Unit (POU). Project delays are only now being reported to justify the RTG's request for a two-year project extension. Moreover, three of the quarterly project implementation status reports were not on file and were not required according to USAID/Thailand officials who did not comment in writing on this issue in responding to the draft report.

Another project monitoring tool that USAID/Thailand did not observe consistently was that of site visits. Site visits when made on a periodic and regular basis help in ascertaining project progress and status. Also, site visit findings when compared to written reports and the implementation plan provide a basis for isolating problem areas and identifying follow-up actions to be taken. USAID/Thailand officials rarely conducted site visits during site construction. When site visits were performed there were often no site reports on the findings. For example, since November 1984, the Nam Mae Hat construction site was visited twice. The site was visited some time in January 1985 and in March 1985. A site visit inspection report was prepared for the visit in January 1985, but a report was not prepared for the March visit. The Huai Lam Sin and Khlong Lam Plok construction sites were visited once in August 1986. Photos of the on-going construction were taken, but a site visit inspection report was not prepared.

USAID/Thailand officials disagreed with the statement that site visits were rarely conducted during site construction and stated the sites had been visited frequently, but that the reporting practice was to record problems or anomalies observed in site visits, rather than prepare site visit reports per se. USAID/Thailand however concurred with the Inspector General viewpoint that site visits should be documented and are now implementing this practice.

The Royal Thai Government (RTG) submitted a program evaluation plan that would require them to submit periodic progress reports commencing in June 1983, and to establish working groups on socioeconomic and engineering aspects. The RTG, however, did not implement the plan. Quarterly progress reports were not submitted until April 1984 and only continued until 1985. The report for the period May through July 1985 was not submitted. The National Energy Administration (NEA) submitted five monthly progress reports for the second group of sites during the period October 1985 through February 1986. At the time of our audit, progress reports were not being submitted by NEA nor had the other program evaluation requirements been established.

USAID/Thailand agreed that progress reports were not submitted until April 1984 and thereafter only until the

technical assistance work was completed. USAID/Thailand contends that periodic progress reports were not called for under the project, but has requested that NEA resume periodic reporting. In this regard, USAID/Thailand concurs in the draft report's recommendation and has already implemented this modification.

USAID/Thailand has not yet monitored any of the \$4.7 million RTG contribution. At the time of our audit, USAID/Thailand officials were unable to present any documentation pertaining to the RTG contribution and were not able to identify the anticipated total costs for the construction of all project sites. Monitoring of host country contributions can provide assurance that host country contributions are timely and sufficient to ensure project success. It also provides assurance that events are occurring as planned. USAID/Thailand contends that there is no need to monitor the RTG contribution because A.I.D. funds eventually will be provided under Fixed Amount Reimbursement Agreement (FARA) which provides reimbursement based on outputs rather than inputs. Although the reimbursement logic for FARA is true, it does not appear to be a sound management practice for USAID/Thailand officials to neglect all monitoring of host country contributions, especially for a project that is over two years behind schedule and where the individual site costs are much higher than planned.

In summary, USAID/Thailand did not monitor the project in accordance with A.I.D. regulations. A program evaluation plan was prepared, but never fully implemented, project status reports did not adequately reflect the true status of the project, and site visits, although occasionally done, were not useful management tools. As a result, USAID/Thailand was not fully aware of the actual status of project activities and of the project's success in meeting A.I.D.'s development and project objectives.

#### Management Comments

USAID/Thailand agrees that certain aspects of project monitoring could have been better performed, and has already implemented procedures to maintain more thorough records of management oversight.

#### Inspector General Comments

This recommendation will be closed upon receipt of documentation showing that project monitoring procedures have been established and implemented and that records of management oversight responsibilities are being maintained.

## B. Compliance and Internal Control

### Compliance

Audit tests made during our review showed that USAID/Thailand had generally complied with Agency development policies, but had not adequately documented how changes in project implementation would affect these policies. Nothing came to the auditors' attention as a result of specific procedures that caused them to believe that untested items were not in compliance with applicable laws and regulations.

### Internal Control

Audit tests showed that internal controls for monitoring project implementation and counterpart funding were weak and need to be strengthened. USAID/Thailand had not adequately monitored the Project in a manner consistent with Agency regulations.

AUDIT OF  
MIRCRO/MINI HYDROELECTRIC PROJECT  
USAID/THAILAND

PART III - EXHIBITS AND APPENDICES

UNITED STATES GOVERNMENT

## memorandum

DATE: October 28, 1987

REPLY TO  
ATTN OF: John R. Eriksson, Director, USAID/Thailand *John R. Eriksson*

SUBJECT: Draft Report on Audit of Micro/Mini Hydroelectric Project

TO: Mr. Leo L. LaMotte, RIG/A/Manila

The subject draft audit report is described as "a program results audit to determine whether the project had achieved or can achieve A.I.D.'s development objectives" (pp. i,2).<sup>1/</sup> The principal "finding" in the draft report is that "A.I.D. development objectives probably cannot be attained unless Project planning documents are revised" (p.5). This assertion appears to be based on the further claims in the draft report that "numerous changes were made in project objectives" and that "it is uncertain whether institutional development objectives are being achieved" (pp.ii,5). RIG/A/Manila concludes that as a result of these alleged conditions "millions of dollars of U.S. funds are being spent without insurance [sic] that the benefits will be long lasting" (pp.ii,5).

USAID/Thailand rejects these purported "findings" and the unsubstantiated and extreme conclusion drawn from them. As we discuss in detail below, the claims made in the draft report are based on erroneous statements of fact, misapprehension of project planning documents and implementation actions, and failure to consider relevant facts and the reasons for Project design and implementation decisions.

DISCUSSIONOverview of the Project

We believe it is important to view the purpose and accomplishments of the Micro/Mini Hydroelectric Project in the context of the economic environment in which it was designed and implemented. The Project was designed and funds were obligated in 1982. At that time, Thailand was heavily dependent on imported oil to meet rapidly increasing demand for electrical power. All economic indicators forecast that the astronomical cost of imported oil prevailing at that time would continue to escalate. In order to cope with

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<sup>1/</sup> All page references, unless otherwise noted, are to the draft audit report provided to USAID/Thailand under a cover memorandum dated July 20, 1987.

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serious depletion of its foreign exchange reserves to pay for oil imports, Thailand was committed to developing indigenous natural resources for electrical power generation. Accordingly, the purpose of the Project, as stated in the Project Agreement, was to assist the Royal Thai Government (RTG) "to reduce Thailand's dependence on fossil fuels for electrical energy generation through the development of economically attractive, local micro/mini hydropower resources."

The Project was designed to accomplish this purpose by providing assistance for institutional development of the National Energy Administration (NEA) and for the construction of up to twelve micro or mini hydroelectric systems. The institutional development and construction objectives are mutually reinforcing by design. Institutional development has occurred through the provision of technical assistance and training to develop and improve NEA's capacity to plan, analyze and construct small hydropower facilities. The skills and site selection model developed under the Project and the analytical skills imparted to NEA personnel have been applied to select and design the six mini hydroelectric systems currently being constructed under the Project. During construction and upon completion and commissioning of these systems, feedback on operations has been and will be used by NEA to refine the site selection model.

The Project was not designed to impose permanently on NEA a particular institutional structure for hydropower analytical capabilities. Nor did the Project predetermine the precise number or size of systems to be constructed; construction subprojects were identified using the selection model developed under the Project. Consequently, the form that institutional development outputs have taken and the characteristics of the construction subprojects that were selected were both consistent with Project objectives and responsive to NEA's needs as Project implementation proceeded.

Dramatic changes in the energy sector internationally and within Thailand influenced the characteristics of both the institutional development outputs and of the subprojects selected for construction. First, the predicted continued rise in the cost of oil imports did not occur, and in fact oil prices plummeted from 1982 levels. This development was not foreseeable at that time. Secondly, Thailand's efforts to develop and exploit indigenous natural gas and lignite resources were vastly more successful and rapid than had been anticipated. In 1985, over 46 percent of electrical power was generated using natural gas and 23 percent using lignite. At the time the Project was designed, the potential exploitation of these resources for electrical power generation was recognized, but when and to what extent they could or would be so used were uncertain. Thus, in 1982, the magnitude of foreseeable economically viable exploitation of hydropower resources was substantial. As the Project progressed, the availability of cheaper imported oil and domestic non-hydropower resources reduced the present and near-term universe of economically viable small hydropower systems.

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However, these exogenous factors do not entail and did not result in NEA's abandoning its commitment to develop hydropower capabilities. NEA continues to recognize the importance of hydropower, particularly over the long-term, as non-renewable indigenous energy sources are depleted, and NEA continues to devote financial resources to hydropower development. Despite the expansion of the Thai energy sector, the percentage of electrical power generated by hydro resources has remained stable and is expected to increase slowly over the medium term.

Moreover, the site selection model developed under the Project has been successfully employed by NEA personnel trained under the Project to identify small hydropower systems that are economically viable even under economic conditions that are more favorable to other forms of electrical power generation than were anticipated when the Project commenced. We believe that the success of the Project in the economic environment that developed is attributable in part to the improved capacity of NEA to use sophisticated analytical models and methodologies as a result of the Project's institutional development efforts.

Nevertheless, developments in the energy sector have justifiably influenced the manner in which NEA has institutionalized its improved hydropower capabilities. If oil prices had remained at 1982 levels or if indigenous non-hydro resources had been developed less rapidly and economically, NEA might have institutionalized the analytical capabilities developed under the Project in a permanent organizational unit devoted exclusively to the hydropower subsector. However, under present conditions in the domestic energy sector NEA does not perceive a need for such a permanent organizational structure. The Project design did not dictate that institutional development should be permanently embodied in a particular organizational scheme. Rather, the Project provided a means for focusing NEA on the hydropower subsector. In so doing, the Project provided the initial impetus and critical technical assistance and training required to develop NEA's hydropower analytical capabilities. However, NEA was a mature line agency before the Project commenced. Thus, once the desired capabilities have been developed, NEA can effectively deploy its hydropower human resources in a variety of ways that may not require the continuing existence of a special organizational unit.

Another important factor bearing on Project activities was the RTG's rapid expansion of the electrical grid. Project planning documents recognized that Thailand's intention to connect some 90 percent of all villages to the national grid before 1990 would influence site selection. In particular, the site selection model was expected on economic grounds to rule out any proposed grid-connected micro system and to favor larger grid-connected mini systems. Accordingly, by taking into consideration the RTG's efforts

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to expand the national grid, even in economically unjustifiable cases,<sup>2/</sup> Project implementors, using the site selection model, selected only mini systems for construction under the Project. Most of these systems are larger mini systems that will be connected to the national grid. This result derived from proper application of the site selection model to identify economically viable systems taking into consideration the cost of alternative electrical energy generating resources and the proximity of proposed systems to the national grid.

The Mission recognizes that in some cases changes in exogenous variables from the conditions assumed originally may require re-design of A.I.D. projects. Although there were fundamental changes in the economics of the Thai energy sector after the Micro/Mini Hydroelectric Project commenced, re-design was not necessary, and the original Project purpose and specific objectives for institutional development and construction have been or are being successfully achieved. The principal reasons for these results are that NEA has not abandoned its commitment to develop and utilize hydropower capabilities and that the Project produced a model, methodology and expertise within NEA capable of identifying economically viable hydropower systems under dramatically different economic conditions than those expected to prevail.

The Mission believes that a meaningful program results audit must be cognizant of the larger environment in which A.I.D. development projects are carried out. Regrettably, the draft audit report on this Project evidences no awareness of fundamental external conditions in the energy sector. In our opinion, the draft report's lack of a basic understanding of the Project's purpose and specific objectives within that context has resulted in a failure to comprehend design and implementation decisions and the reasons why Project outputs are shaped as they are.

#### Attainment of Project Objectives

The draft report asserts that "A.I.D. development objectives probably cannot be attained unless project planning documents are revised" (p.5). This assertion is based on the further claims that "numerous changes were made in project objectives along the way" and that "it is uncertain whether institutional development objectives are being achieved" (p.5). The draft

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<sup>2/</sup> For example, for political and security reasons, the RTG may run transmission lines dozens of kilometers over rugged terrain to reach small, isolated villages.

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report adduces no competent evidence in support of these contentions.<sup>3/</sup>

### Project Objectives

The draft report purports to establish that "numerous and significant changes [were] made to original Project objectives" (p.6). The upshot of the discussion in the draft report appears to be that the Project Paper contemplated providing assistance to develop the analytical capabilities of NEA for both micro hydropower systems (up to 100 kW capacity) and mini hydropower systems (up to 1,000 kW capacity) and assistance to construct up to twelve micro or mini systems, whereas in fact the Project is currently supporting construction of only six hydropower systems, none of which falls in the micro range and two of which slightly exceed the defined maximum of 1,000 kW for mini hydropower systems. RIG/A/Manila appears to believe that the construction of only mini systems and no micro systems constitutes a change in Project objectives.

Although the draft report lacks any clear argumentation of this point, we presume from the unrelated and conclusory statements in the draft report that the underlying criticism is that Project planners (i) should have, but failed to, anticipate that no micro hydropower systems would be constructed, (ii) seriously overestimated the availability of economically viable small hydropower sites and used an inappropriate site selection model, and (iii) designed a Project for smaller scale hydropower systems than NEA intends to construct under its master plan. Then, the argument presumably would continue, in the face of these alleged Project design deficiencies, Project implementors were constrained to modify Project objectives by eliminating micro systems and building fewer and larger mini systems.

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<sup>3/</sup> The Mission notes as a threshold matter that we do not understand how the claim that changes were made in Project objectives, even if it were true, supports the "finding" that development objectives cannot be attained. Assuming, counterfactually, that Project managers had changed Project objectives, program results presumably would be measured in terms of the modified objectives. In such a hypothetical case, the fact that objectives had been changed would have no bearing on the question of whether project objectives, as modified, had been or could be attained. Conceivably, the draft report intends to advance the argument, based on the gratuitous and baseless suggestion that Project objectives were modified without proper authority, that the Project is not attaining the original, authorized objectives, but rather a set of unauthorized, modified objectives. In such a case, it could be argued that Project accomplishments should be measured against the original objectives. However, even if the draft report had coherently articulated such an argument, the point would be moot, since the original Project objectives were not modified.

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The Mission questions both the premises and the logic of this argument. First, as noted in our Overview above, the Project has two mutually-reinforcing objectives:

- (1) Institutional Development: "The development of an analytical capacity and method which will permit the RTG to improve sectoral planning and development."
- (2) Construction: "The construction of up to 12 hydroelectric generation systems."<sup>4/</sup>

The Project design provided for the use of the site selection model developed under the Project to select construction subprojects and for feedback data from subprojects to be used to refine the model. The Project design did not predetermine the precise number or size of hydropower systems to be constructed or entail that subprojects had to comprise a mix of both micro and mini systems. The Project Paper postulated that the construction of ten to fifteen systems was necessary to obtain reliable feedback data for the model. Based on funding constraints, the Project Paper estimated that twelve systems would be constructed. Of these twelve estimated subprojects, six had been analyzed on a cost-benefit basis prior to commencement of the Project. Those analyses were used in the initial development of the site selection model, which was to be used in the identification of the remaining six facilities estimated to be constructed under the Project.

However, the Project paper expressly recognized that "the final number of sites will depend on several factors: actual power plant size, actual inflation over time, analytical 'quality' of sites (quality of data, representativeness of sites, etc.)"<sup>5/</sup>. As noted in our Overview earlier, the Project Paper foresaw that the site selection methodology would favor larger mini systems, principally because of the anticipated expansion of the national grid. That is, grid-connected micro systems were expected to be rejected because of the uneconomic operations and maintenance costs entailed by grid connection, and because the number of economically justifiable isolated micro systems was expected to be limited by the extent of grid expansion to remote areas. With respect to mini systems, existing or planned grid extension to a site favored larger mini systems, since the unit cost of hydro-electric power is inversely proportional to the generating capacity of the power plant and since power in excess of the local community's needs could be sold to the grid. Thus, the subprojects being constructed under the Project were selected on the basis of the application

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<sup>4/</sup> Project Agreement, Annex 1, p.1.

<sup>5/</sup> Project Paper, p.18.

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of the selection criteria intended to be used in the Project.<sup>6/</sup>

The actual design capacity of the systems under construction is a function of what is economically justifiable and of the fact that the systems are based on "run-of-the-river" engineering. Run-of-the-river hydropower engineering involves diversion of all or part of the naturally available, unimpounded water resource to the turbine plant. Thus, once a site is determined to be suitable for a micro or mini system within the defined ranges (up to 100 kW and 1,000 kW, respectively), the design capacity of the plant is not artificially and uneconomically limited to those ranges if the naturally available, unimpounded water resource is capable of generating more power. Consequently, the design capacities of two of the six mini systems currently under construction slightly exceed the Project's defined maximum of 1,000 kW for mini systems.

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6/ We note at this juncture that we do not understand the assertion in the draft audit report that "if institutional development is not achieved, the project will merely contribute to the expansion of the RTG national electricity grid and provide supplemental power for the grid" and that "as a consequence, the A.I.D. funds provided for this project could be considered primarily as budgetary support for expansion of the RTG national electricity grid" (p.17). The upshot of this "argument" seems to be that whereas institutional development is a valid project assistance objective, support for the construction of grid-connected mini hydropower systems is non-project budget support.

We do not understand the basis for the view that "mere" construction of mini hydropower systems is a form of budget support. The systems are being constructed under an A.I.D. project developed and justified in accordance with the standards for project assistance set forth in A.I.D. Handbook 3. There is no element of non-project assistance for budget support involved. We presume that the fact that the RTG wants to construct these systems, has or might include them in its national infrastructure development program and might have included them in their national budget does not thereby convert project assistance into budget support. We also presume that the draft audit report does not wish to assert the baseless proposition that connection of a hydroelectric system to the national grid per se constitutes budget support. Conceivably, the draft report wishes to suggest, not that construction of grid-connected systems is non-project assistance, but that it is project assistance that is not consistent with a focus on small, renewable resource systems for rural communities. However, in fact, the principal physical output of the systems being constructed under the Project will be to electrify rural communities of several thousand inhabitants each; grid connection in those cases provides a means to utilize the available hydro resources economically by selling power in excess of community needs to the national power network.

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Since the systems selected for construction using the model developed for the Project are predominantly larger mini systems, and do not include any micro systems, the average cost per system is higher than had been projected in Project planning documents. In addition, inflation has resulted in somewhat higher costs for system construction than was projected. However, as a result of effective use of the site selection model by NEA, the actual cost per kilowatt will be less than 40 percent of project design estimates.<sup>7/</sup>

The Mission and NEA believe that feedback from the six systems under construction will provide sufficient data to refine the site selection model as planned. First, NEA is already slightly modifying the model based on feedback from project and non-project sites it has wider construction. Thus, the sample size and diversity of subprojects alone support this conclusion. Secondly, the outputs for the construction objective of the Project actually equal or exceed the estimates in Project planning documents for the key goal of reinforcing the institutional development objective. This reinforcement occurs by applying the site selection model and analytical capabilities developed in NEA to select the construction subprojects and obtaining feedback from those subprojects to refine the model and methodology. Specifically, in the planning stage it was estimated that twelve subprojects would be supported, of which six had been previously selected in the course of developing the model; the remaining six estimated subprojects were to be selected using the model so developed.

However, Project implementors decided to test the model on the six previously selected subprojects. This decision was based in part on the incorporation of least-cost as well as cost-benefit analysis in the model. Least cost analysis was included in the model in part because of the RTG's stated intention to extend the national grid to virtually the entire nation. Simply put, in such circumstances, the question in many cases would not be whether electrification of an area was economically justifiable, but what electrical power generating method would be least costly given that the area would be electrified in any event for political, security or other reasons. As a result of applying the model, only two of these original six subprojects proved to be economically viable. Rather than construct the other four previously selected systems, the model was applied to other potential sites. Thus, all six of the subprojects currently supported under the Project applied and tested the model, equalling the six estimated in planning documents.

The size of the universe of economically viable small hydropower sites is a valid concern, although not for the reasons asserted in the draft report. Least cost analysis of hydropower in a period of relatively cheap oil and plentiful indigenous natural gas and lignite necessarily reduces the

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<sup>7/</sup> \$3,303/kW estimated in the Project Paper versus \$1,190/kW actual costs.

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number of hydropower sites that are economically justifiable under those circumstances. However, the Master Plan currently being developed by NEA is expected to identify over 800 potential small hydropower sites, of which 200 are reasonably predicted to be financially viable under present economic conditions in the Thai energy sector. As non-hydropower electrical energy generating resources become more costly or are depleted, as anticipated, a larger number of these potential sites will become economically justifiable.

The fact that NEA's plans for small hydropower include systems with a design capacity of up to 6,000 kW has no bearing on the attainment of Project objectives.<sup>8/</sup> The definitional maximum capacity of a "mini" hydropower system is essentially arbitrary, since the same set of analytical tools and skills, engineering expertise, and construction and project management capabilities is required for developing any "run-of-the-river" system. As a practical matter, run-of-the-river engineering would rarely be capable of generating more than 15,000 kW of electrical power capacity, but commonly would be expected to yield systems up to the 5,000 kW range, with the largest concentration in the 1,000 - 3,000 kW range. The principal advantage of building mini systems in the 1,000 kW range under the Project has been to provide support for a sufficient number of different systems to test the site selection model developed for the Project.

In short, the Mission rejects the claim that Project objectives were changed. A site selection model was developed and applied to select construction subprojects as planned. Potential subprojects were selected or rejected using the model as applied in the economic environment prevailing during Project implementation and in the context of the RTG's rapid expansion of the national grid. The selected subprojects are being constructed utilizing the planned engineering design and have yielded and will continue to yield data for refinement of the selection model and methodology. The selection model and the skills imparted to NEA are being used in planning and implementing additional small hydropower systems, whether financed from this project or from other resources.

#### Institutional Development

The draft report asserts that "it is uncertain whether all appropriate institutional development aspects are attainable" and alleges that "this occurred because many of the institutional development concepts in the project design were not fully adhered to by the RTG implementing agency"

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<sup>8/</sup> Moreover, the assertion in the draft report that the average size of presently planned mini hydropower systems is 2,500 kW is misleading. Since NEA defines a mini system in the range up to 6,000 kW, the universe of planned systems includes several at the high end; however, the largest numbers of planned systems are closer to the 1,000 kW size.

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(p.12). The "evidence" cited in support of these contentions appears to consist of: (i) the observation that only six hydropower systems are currently being constructed rather than twelve as estimated in the Project Paper; (ii) the observation that the NEA Project Operations Unit (POU) called for in Project design documents was staffed by only five employees at the time the audit was performed; (iii) the allegation that the only accomplishment in institutional development was the development of a site selection model that has "significant deficiencies" (p.15); and (iv) the claim that personnel turnover "has reduced NEA's ability to design and construct a large number of hydro-electric projects" (p.15). We address each of these assertions in turn.

First, the mere fact that only six hydropower systems are currently being constructed, rather than twelve as estimated in the Project Paper, does not establish that institutional development has not or will not occur. As we have discussed in the preceding section, Project planning documents did not predetermine the number and size of construction subprojects. As far as institutional development is concerned, the key question is whether a large enough sample of subprojects is being undertaken for NEA to apply the selection model using analytical skills developed under the Project and to obtain feedback data in order to refine the model. As noted above, the Mission and NEA believe that the six systems being constructed meet this objective. The draft report lacks any argumentation that places this belief in doubt.

Secondly, the draft report fails to demonstrate how its observations about present staffing of the POU establishes that institutional development has not and cannot occur. As noted in the Overview above, the Project was not designed to impose permanently on NEA a particular institutional structure for hydropower analytical capabilities. Rather, project designers saw the need for a mechanism for providing the initial impetus and technical assistance and training required to develop NEA's human resources.

The POU was established to provide this focus. As stated in the Project Agreement:.

"A key concept of the project is the creation of a special project analysis management group in NEA, the Project Operations Unit (POU). Because the small-scale hydroelectric sector is a new area of analysis for Thailand and for NEA, POU was deliberately established outside of existing NEA divisions in order to focus full-time NEA and contract skills on the specialized task placed before it."

The POU has successfully performed its intended function. It was established upon commencement of the Project and staffed by Project-financed expatriate and Thai professionals and their NEA counterparts. The POU staff included a Senior Engineer/Project Coordinator, an NEA Project Manager,

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an NEA Field Engineer, a Construction Manager, Socio-Economic Analysts, Consumer Promotion Specialists, Manufacturing Promotion Specialists, Mechanical and Electrical Engineers, a Load Forecast Specialist, and Computer Specialists. The POU operated with this staffing pattern for 22 months, during which time it produced and applied the Integrated Analytical Site Selection Model. When this phase of Project activities was completed, the contracts of Project-financed professionals were terminated and the POU staff was reduced to five full-time Project-trained NEA employees and thirteen Project-trained employees assigned to regular NEA divisions who are available when needed for POU functions.

The principal Project related reason for scaling down POU prior to Project completion is that the primary remaining POU activity is obtaining and analyzing feedback data on subprojects. These data will not become available until systems have been constructed and commissioned. The principal non-Project related reason for scaling down POU is that NEA has institutionalized the hydropower analytic capabilities developed under the Project within existing NEA divisions. The Mission believes that NEA's deployment of its hydropower human resources in this manner is fully consistent with the Project design's plan of providing the required initial focus through the POU. As was noted in the Project Paper, "it is not clear at this point ... if POU has the potential for evolving into a specialized line office in its own right, or if its responsibilities will eventually be re-assigned to other NEA bureaus".<sup>9/</sup> As we observed in the Overview above, it is unlikely that a mature line agency such as NEA will perceive a need for a special organizational unit devoted to hydropower in the present economic environment. Rather, the improved hydropower analytical skills are being utilized by NEA personnel in various NEA divisions that also have responsibilities for other energy subsectors.

Thirdly, the draft report alleges that the only accomplishment in institutional development was the development of a site selection model that has "significant deficiencies." This contention is not supported by the evidence. First, the site selection model has not been shown to have "significant deficiencies." The draft audit report relies on several critical comments about the model contained in a preliminary report of the external evaluation team that was conducting a planned process evaluation of the Project at roughly the time the audit work was performed. Based on discussions of the preliminary and subsequent final draft evaluation report with USAID and NEA personnel, the evaluation team has modified some its tentative conclusions about the site selection model, as well as its conclusions about other aspects of the Project. More importantly, however, is the fact that most of the areas of difference between the evaluation team and Project designers and implementors concern matters of professional judgment about which equally competent professionals may have reasonable differences. Thus, for example, the question of the proper analytical

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<sup>9/</sup> Project Paper, p.17.

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"mix" in the model to account for such issues as micro vs. mini systems or grid-connected vs. isolated systems, is not simple and obvious.

The Mission does not maintain and does not wish to imply that we believe that the selection model is perfect. The model can and will be improved. Project implementors identify appropriate refinements by using the model and obtaining feedback data from systems, as well as from the assessments of external evaluators. However, we do maintain that the model developed for the Project was a defensible, effective professional product. The evaluation team did not dispute that judgment, and the draft audit report has produced no evidence to question it.

The implication in the draft report that development of the selection model was the only accomplishment in institutional development is not supported by the facts. It is true that the development and application of the model were the central focus for institutional development. With that focus, technical assistance contractors under the Project provided on-the-job training to some 30 NEA employees to enhance analytical skills needed to use and refine the model. In addition, technical assistance was provided to improve policies and procedures of NEA in the hydropower subsector. As a result, in addition to acquiring improved analytical capabilities, NEA has attained improved capabilities in construction contracting and project management of small hydropower systems.

The fourth point made in the draft audit report about institutional development concerns turnover of NEA staff. USAID and NEA agree that staff turnover makes the task of institutional development difficult and leads to less than ideal results. Staff turnover occurs primarily because qualified NEA employees can locate better paying employment opportunities in the private sector and with para-statal enterprises. Unfortunately, the disparity in salary levels is a structural problem that this Project cannot remedy. The real question is whether meaningful institutional development has and can occur despite this constraint.

We believe that the answer to that question is "Yes." Policy and procedural improvements in the hydropower subsector have been institutionalized at NEA and persist notwithstanding some staff turnover. NEA is institutionally committed to using and refining the site selection model and appears to have the ability to retain personnel with the skills needed to use the model and to attract new personnel who already have or can acquire those skills. In addition, Mission Project managers have observed through anecdotal evidence that the re-deployment of employees associated with the POU during original development of the selection model into existing NEA divisions has broadened the impact of institutional development by converting more NEA employees from "old school" to "new school" thinking about hydropower. In short, institutional development has occurred, not as ideally as would be the case in the absence of staff turnover, but with significant positive impact on the on-going efforts of NEA in developing hydropower resources.

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A good summary of our reasons for rejecting the assertion in the draft report that the Project cannot attain its objectives is found in the conclusions of the draft external evaluation, as cited in the draft audit report (p.7). The evaluation concluded that the Project has:

- (i) provided an institutional focus for the development of mini-hydro within Thailand;
- (ii) allowed NEA and the private sector to refine their abilities in the rationale for selection of sites for the development of mini-hydro facilities;
- (iii) allowed both NEA and the private sector to develop capabilities for the design of hydropower facilities in the .5 to 1.5 kW range, including the design of civil works and specifications for mechanical equipment;
- (iv) provided the Thai private sector with a limited market for the fabrication of electrical and mechanical equipment; and
- (v) resulted in the construction of six mini hydro facilities in the rural areas of Thailand, with planning underway for an additional two sites.

In our opinion, these conclusions are evidence of a Project that is successfully attaining its objectives.

#### Adequacy of Project Monitoring

The draft report also concludes that the Project "was not adequately monitored by USAID/Thailand nor was the program evaluation plan fully implemented as required ..." (p.18). The Mission agrees that certain aspects of Project monitoring could have been better performed, and has implemented improvements where deficiencies existed. However, we question the factuality of some of the claims made in the draft audit report, dispute the significance of other claims and note generally that the draft report ignores that the extent of monitoring should be commensurate with the requirements of the project activities.

First, the draft report observes that periodic progress reports were not submitted until April, 1984, instead of June, 1983 as planned. This statement is true, but ignores the basis for the expectation. The evaluation plan submitted by NEA contemplated that periodic reports would be submitted once the architectural and engineering contractor for the Project was in place. This contract was expected to be in effect in 1983, but was not executed until 1984, at which point periodic progress

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reports were provided as planned. Periodic reports were prepared with the assistance of the technical assistance contractors until the technical assistance work was completed as planned. Although further periodic reports were not called for, the Mission has requested periodic reporting be resumed. In this regard, the Mission concurs in the draft report's recommendation and has already implemented this modification.

Secondly, the draft report alleges that "USAID/Thailand officials rarely conducted site visits during site construction" (p.20). This statement is factually incorrect. The Nam Mae Hat construction site had been visited five times by USAID/Thailand engineering staff at the time the draft report was prepared, not two times as alleged in the draft report. The Huai Lam Sin and Khlong Lam Plok site were each visited seven times, and not once as alleged. In addition, the Deputy Mission Director has visited five sites under construction, the Mission Controller and Deputy Controller have each visited two sites, and the Mission Director and Deputy Chief of Mission (DCM) have visited one site. Mission reporting practices were to record problems or anomalies observed in site visits, rather than to prepare site visit reports per se. We now concur in the draft report's view that routine site visit reports are advisable even when no irregularities are observed, in order to have a record that monitoring requirements are being satisfied, and have implemented this practice.

Thirdly, the draft report states that "USAID/Thailand also had not monitored the \$4.7 million RTG contribution" (p.20). RTG counterpart contributions to the Project consist of financing 50 percent of the cost of constructing the hydropower systems selected under the Project. A.I.D. financing is being provided under Fixed Amount Reimbursement Agreements, in accordance with which A.I.D. will reimburse the RTG for 50 percent of the mutually-agreed upon cost of system construction upon completion and acceptance of a system by A.I.D. as eligible for reimbursement. Thus, there is no requirement for monitoring the RTG contribution since FAR procedures provide for reimbursement based on outputs rather than inputs. Although construction is progressing, none of the systems has been completed and accepted at this time. No A.I.D. funds for construction have been expended. Nevertheless, the fact that subprojects are under construction indicates that RTG funds are being utilized as planned.

Finally, we reject the general conclusion asserted in the draft report that "USAID/Thailand was unaware of the actual status of project activities and of the project's success in meeting A.I.D.'s development and project objectives" (p.18). As of the time of the audit work, Mission Project managers had visited the first three construction sites a total of 19 times. In addition, Mission managers met frequently with NEA and contractor personnel for general consultations, bid openings, contract awards, engineering design discussions, POU staff meetings, conferences to resolve electro-mechanical equipment supply difficulties and other routine project management functions. (The Mission has already implemented procedures to

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maintain more thorough records of management oversight, but maintains that monitoring was performed as planned at a level commensurate with requirements for Project management.

#### Recommendations

The draft audit report contains two recommendations. The first would require the Mission to "verify, justify and document a plan to ensure A.I.D. policy objectives of institutional development will be fully accomplished" (p.5) and the second to "develop and implement a system to provide effective project monitoring over the remaining life of the project" (p.18). For the reasons detailed in the foregoing discussion, we believe that these recommendations are frivolous. The Micro/Mini Hydroelectric Project is successfully achieving its planned institutional development and construction purposes, notwithstanding dramatic changes in the economics of the energy sector from the time the Project was designed. Project monitoring by the Mission has been carried out as planned and we have implemented procedures to ensure that monitoring activities are fully documented in Project files. We do not believe on the basis of the evidence that the draft audit report has identified any actionable condition. We therefore request that the first recommendation be withdrawn and that the second recommendation be closed upon issuance of the final audit report.

3/2

Draft: RLA:EMiller

Clear: PDS/ENG:Mintara:(draft)  
PDS/ENG:Sloan:(draft)  
PD:WBaum: with date 10-28-87  
FIN:TFallon: and date 10/24  
ADD:EPloch: EP date 10/20

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List of Recommendations

	<u>Page</u>
<u>Recommendation No. 1</u>	5
We recommend that USAID/Thailand specifically document what now constitutes adequate technological institutional development for this project in accordance with agency policy. This action should ensure the long lasting effect of institutional development.	
<u>Recommendation No. 2</u>	13
We recommend that USAID/Thailand improve project monitoring procedures and activities over the remaining life of the project, especially the documentation and analysis of management actions taken.	

Report Distribution

APPENDIX 3

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