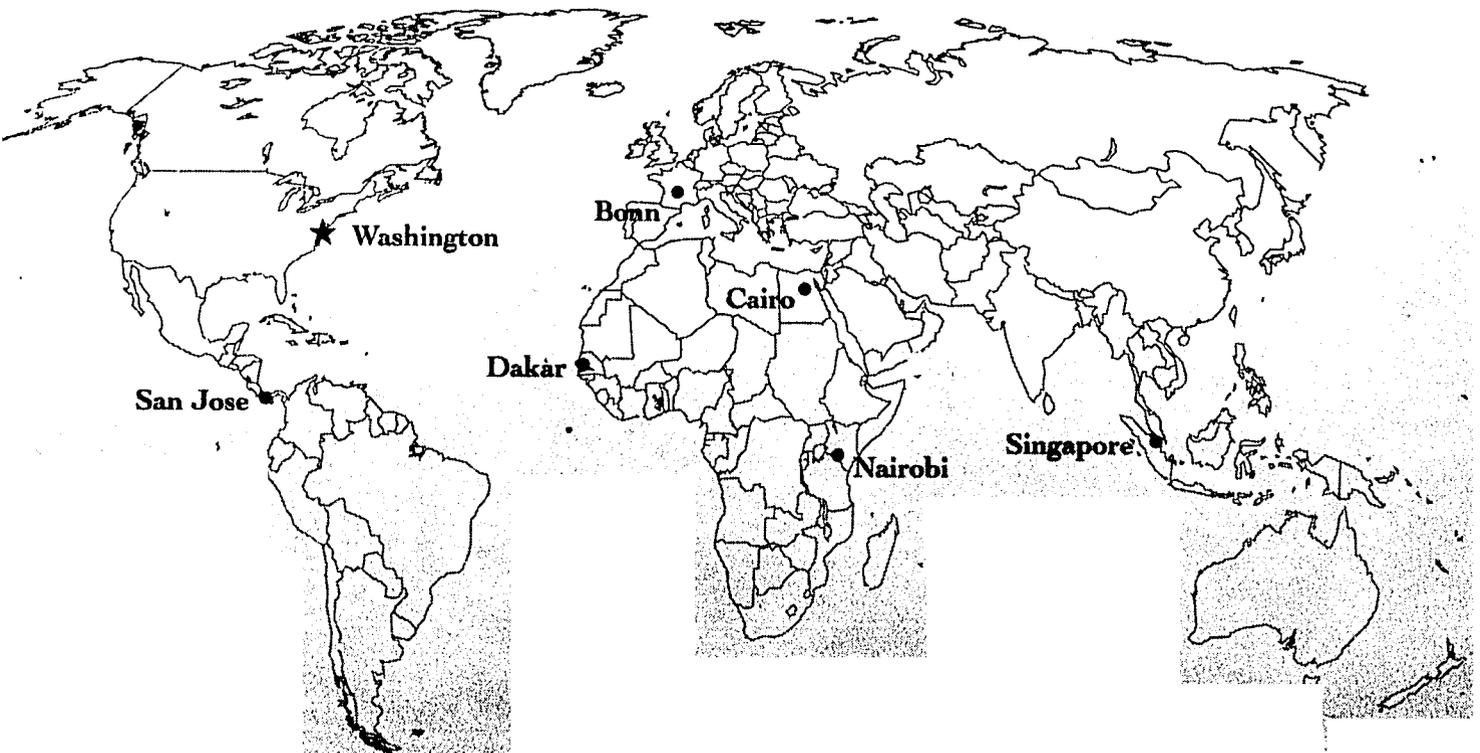


Regional Inspector General for Audit
Cairo, Egypt

Audit of USAID/Egypt Commodities Procured for Power Projects

No. 6-263-95-003
January 31, 1995



U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT



UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT
OFFICE OF THE REGIONAL INSPECTOR GENERAL/AUDIT

January 31, 1995

MEMORANDUM FOR DIRECTOR USAID/Egypt, John R. Westley

FROM : RIG/A/C, *Philippe L. Darcy*

SUBJECT: Memorandum Report on the Audit of USAID/Egypt Commodities
Procured for Power Projects, Report No. 6-263-95-003

This memorandum is our report on the subject audit. Overall, the audit found that USAID/Egypt adequately monitored USAID-funded commodities to ensure that commodities were properly maintained, stored, and controlled. The Mission procured an adequate supply of spare parts and personnel from the Egyptian Electricity Authority had been trained to maintain commodities procured for each of the plants. However, the Mission could do more to improve the maintenance planning and scheduling of power projects once USAID-financed equipment has been installed.

Accordingly, the report contains one recommendation for USAID's action oriented toward planning for improved maintenance systems. USAID/Egypt agreed to work with Egyptian authorities to improve maintenance systems. Therefore, the audit recommendation is resolved and may be closed once an acceptable plan for improved maintenance has been received from the Egyptian Electricity Authority. I appreciate the cooperation and assistance provided to the auditors on this assignment.

Background

This audit is one of several being conducted by the Office of the Inspector General on commodities financed by USAID. The Regional Inspector General for Audit/Dakar is leading the Agency-wide effort and will issue a report summarizing the results of these audits.

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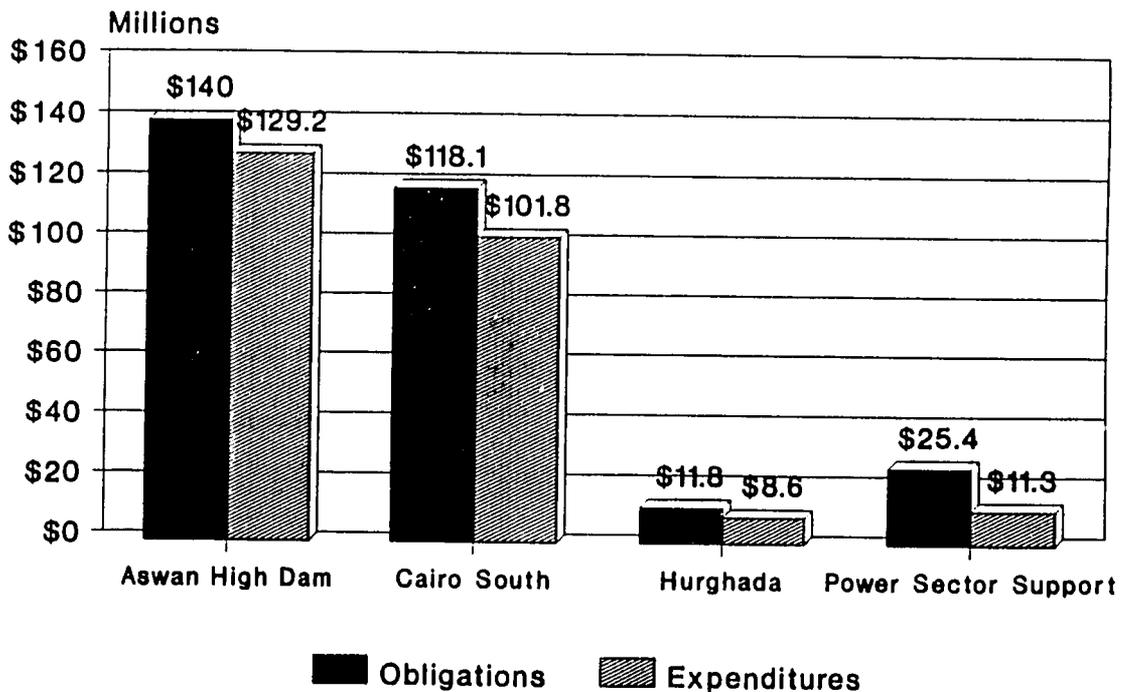
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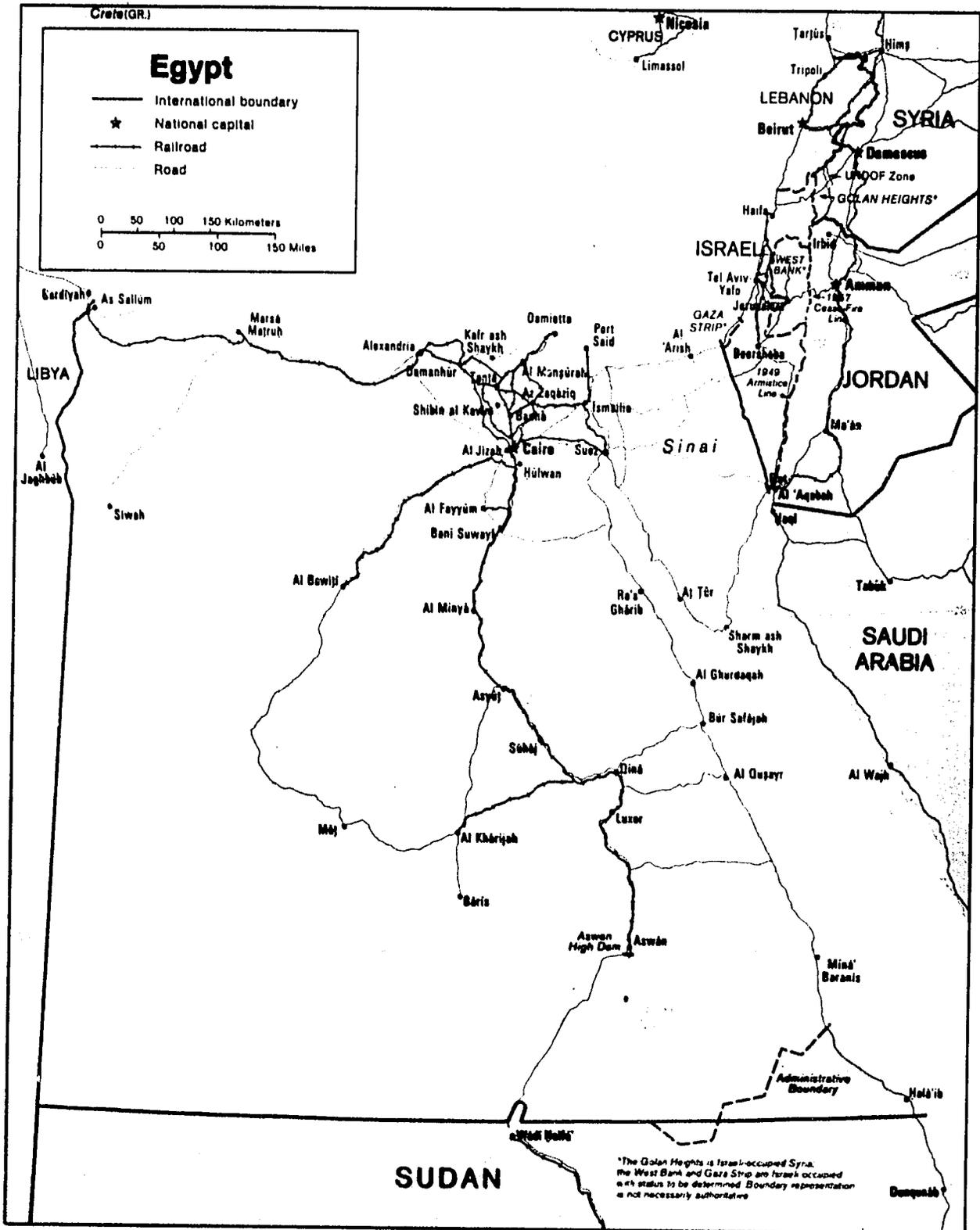
USAID/Egypt's current portfolio of power projects, which provide project and commodity assistance to support the development of electric power in Egypt, includes 14 power projects with obligations of \$685.6 million and expenditures of \$329.3 million financed by USAID/Egypt since 1982. We limited audit work to four of the higher dollar value projects where commodities had arrived in country. These projects had expenditures of about \$250.9 million as of September 30, 1994 and included a hydroelectric power plant in Aswan, a combined cycle gas/steam power plant near Helwan (Cairo South), a gas turbine power plant in Hurghada, and the Power Sector/Commodities Studies Project (Power Sector Support)

USAID/Egypt's Office of Power and Telecommunications within its Development Resources Directorate is responsible for monitoring these projects. The four projects we selected for review (chart) are being implemented by the Egyptian Electricity Authority.

Power Projects Audited

Amounts as of September 30, 1994





Base: 801035 (B00159) 2 88

Audit Objective

In accordance with our Fiscal Year 1994 Audit Plan, the Office of the Regional Inspector General for Audit/Cairo audited commodities procured for power projects in Egypt to answer the following audit objective:

Did USAID/Egypt monitor USAID-funded commodities to ensure that commodities were properly maintained, stored, and controlled?

Appendix I contains a complete discussion of the methodology for this audit.

Audit Findings

Did USAID/Egypt monitor USAID-funded commodities to ensure that commodities were properly maintained, stored, and controlled?

Except for maintenance planning, USAID/Egypt adequately monitored USAID-funded commodities to ensure that they were properly maintained, stored, and controlled.

The Mission monitored USAID-funded commodities through review of progress reports from engineers and conduct of site visits. Such monitoring was conducted frequently and helped to identify and resolve problems encountered during project implementation. To illustrate, the Mission:

- received progress reports from the Cairo South contractors monthly, and about every two months on the Aswan High Dam and Hurghada projects.
- made frequent site visits to the three plants to identify problems that still needed resolution, and took action where assistance was needed.

Also, during the audit we found that the project officers were well informed about project operations.

The combined results of good monitoring by USAID/Egypt and effective actions by the Egyptian Electricity Authority were evident during our visits to the three plants. With regard to maintenance, USAID/Egypt ensured that the Authority's personnel had been trained to provide the necessary maintenance and that the Authority obtained spare parts and maintenance manuals.

With regard to storage of spare parts, we found that the Authority had implemented effective controls to ensure that commodities were adequately protected. In our visits to 10 warehouses at 6 locations, we found that the Authority:

- protected commodities from the weather by storing commodities on shelves in warehouses, and
- safeguarded commodities by limiting physical access to the commodities and by providing fire protection equipment.

Finally, with regard to inventory controls, we found that the Authority had adequate controls in place. We were able to verify that shipped spare parts:

- had been received,
- were tagged and recorded in an inventory register, and
- were accounted for through an annual physical inventory.

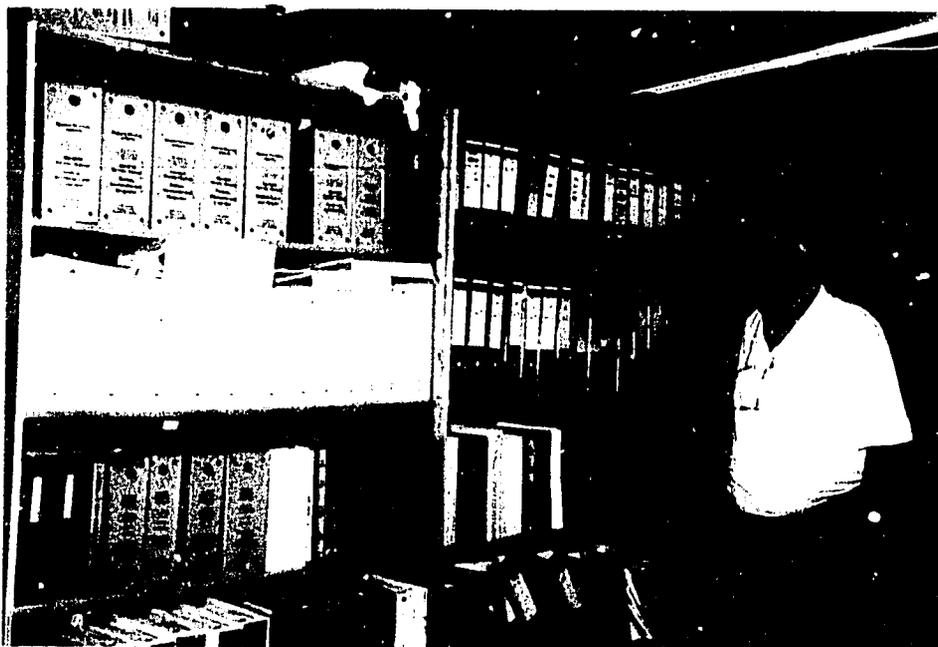
However, USAID should work with the Authority to improve the planning and scheduling of maintenance once installation of equipment has been completed. This would provide better assurance that equipment is properly cared for after installation.

Improved Maintenance Planning Needed

If management is to have reasonable assurance that equipment is maintained, it must have a maintenance plan or, where appropriate, an automated work order system that can schedule detailed maintenance procedures. These provide a map to guide an organization's efforts to ensure that all maintenance is performed. Without such a map or guide, certain detailed maintenance procedures may not be followed, thereby impairing plant operation and jeopardizing USAID/Egypt's investment.

At the three power plants visited, we found that maintenance planning systems: (1) had no maintenance plan and no automated work order system (Hurghada), (2) had a maintenance plan that did not identify specific procedures (Aswan High Dam), or (3) had a work order system that was not updated to include required maintenance procedures for equipment financed by USAID (Cairo South). This occurred because the Mission did not include a provision in contracts to require that maintenance planning and scheduling systems be implemented. As a result, the Mission had insufficient assurance that maintenance would be performed according to manufacturer's specifications.

Recommendation No. 1 We recommend that USAID/Egypt ensure that the Egyptian Electricity Authority's plan for improving preventative maintenance procedures, due in 1995, provides for implementing maintenance planning and scheduling systems.



Manuals Used in the Combined Cycle Steam/Gas Turbine Power Plant near Helwan -- USAID/Egypt Project 263-215.01 (November 1994)



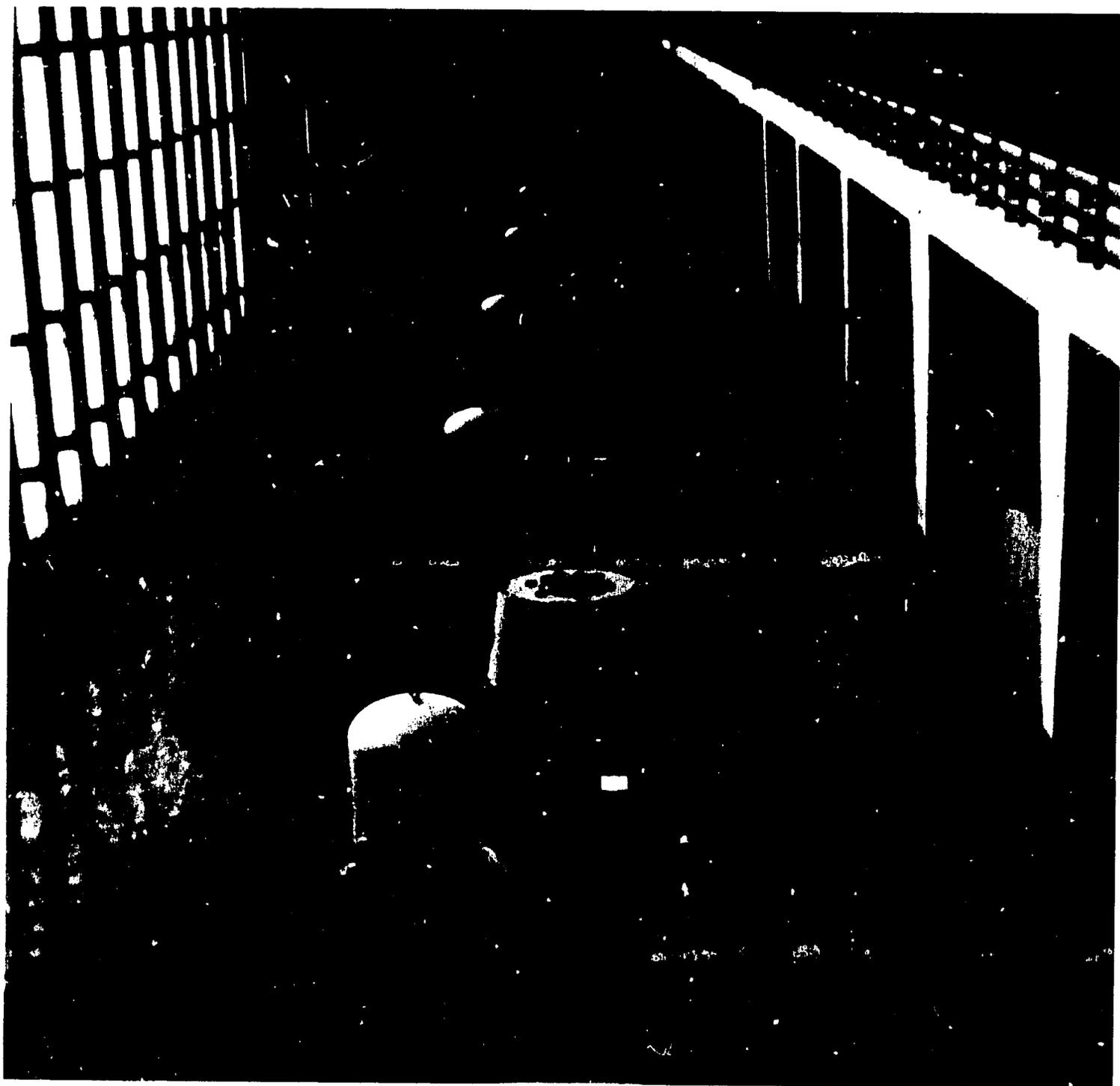
Spare Parts Stored in a Warehouse at Hurghada's Gas Turbine Power Plant -- USAID/Egypt Project 263-215.03 (September 1994)

Manufacturer's manuals specify what kind of maintenance should be performed, at what time interval, and how. A modern power plant can have over a hundred such manuals, enough to fill a wall in a room. (See page 6.)

Given the volume of information in manufacturer's manuals, there should be a systematic method of ensuring that the detailed procedures in these manuals are followed. Without such a method, certain detailed maintenance procedures may not be followed. One way to help ensure all procedures are followed is to develop a detailed maintenance plan. An even better procedure is to develop an automated work order system. Such a system can generate work orders for specific maintenance tasks on a weekly or monthly basis.

The three plants we visited did not have a plan or automated program for generation of work orders that management could follow to ensure that USAID-financed equipment was maintained. To illustrate:

- The Hurghada gas turbine power plant did not have either a plan or an automated work order system to generate work orders for the authorization and conduct of specific maintenance procedures. Instead, it relied on a manual work order system, thereby leaving open the possibility that specific maintenance procedures described in manufacturer's manuals may not be addressed because of their volume.
- The Cairo South combined cycle power plant had an automated work order system, but this system had not been updated with maintenance procedures for new equipment financed by USAID.
- The Aswan High Dam hydroelectric power plant's maintenance plan lacked specificity. While an overall plan was prepared that scheduled maintenance on the plant's 12 turbines monthly and annually, it does not detail what specific maintenance procedures should be conducted. A manual work order system was being used, but we found that work orders were not always generated and those that were generated did not specify maintenance tasks to be performed. For example:
 - On the 500 kilo-volt circuit breakers, work orders did not list the specific maintenance procedures to be performed. The maintenance record, prepared after our first visit, listed some detailed procedures performed but did not address five important steps to be performed annually, such as changing the air compressor's lubricant and filter.
 - On the turbines' governors (a governor is an electrical/hydraulic device that controls the speed of turbines), work orders were not prepared for 10 of the 12 governors in 1993, and where work orders were prepared they were very general—only calling for "annual maintenance" without listing maintenance procedures. The responsible engineer advised us that he had no maintenance logs, but recognizing the importance of records, he subsequently prepared a log based upon his personal notes of what maintenance was performed.



Proper Maintenance and Storage Support Can Enhance the Life of Generators and Protective Relays at Aswan's High Dam Hydroelectric Power Plant -- USAID/Egypt Project 263-0160 (Mission Photograph)

- For the power-line carrier communication equipment, the responsible engineer advised us that no work orders were prepared scheduling maintenance to be performed. Also, no maintenance records had been prepared since commissioning of the equipment in 1991.

Our review of contracts for expansion and rehabilitation of the plants showed that USAID/Egypt had not incorporated provisions in contracts to require that maintenance planning and scheduling systems were installed or upgraded. USAID/Egypt personnel stated that they had been aware of the limitations of the Authority's preventative maintenance and scheduling systems and had taken a number of actions to correct the situation.

USAID financed a policy reform and institutional development assessment, completed in December 1993, that recommended the adoption of uniform preventive maintenance programs for Egypt's power plants. Then, in May 1994, USAID/Egypt signed a memorandum of understanding with the Egyptian Electricity Authority, whereby the Authority agreed to take a number of actions towards meeting reform targets. One such target was the improvement of maintenance procedures in power plants. The Authority agreed to submit a plan for implementing preventive maintenance procedures by June 1995 and have these procedures operational in 50 percent of plants by June 1996 and in 75 percent of its plants by June 1997. However, there is no guarantee that the plan will include maintenance planning and scheduling systems.

An institutional development contractor, to be on board by January 1995, is to help the Authority develop this plan. After the plan is received, the Mission can determine whether or not appropriate action is being taken to implement maintenance planning and scheduling systems for power plants receiving USAID-financed commodities.

We support USAID/Egypt's and the Authority's efforts to implement improved maintenance procedures. However, we believe that these efforts can be better focused by the Mission ensuring that specific maintenance and scheduling systems are implemented. The Mission should ensure that the Authority's plan specifically provides for the implementation of maintenance planning and scheduling systems. The implementation of good planning and scheduling systems will help ensure that maintenance procedures are followed, with the likely result that USAID-financed equipment in these plants will be adequately maintained.

SCOPE AND METHODOLOGY

Scope

We conducted our audit in accordance with government auditing standards. We performed the audit from August 16 through November 30, 1994 at the offices of USAID/Egypt and contractors, as well as the Egyptian Electricity Authority's plants and storage facilities in the cities of Abu Sultan, Aswan, Cairo, Hurghada, and Talkka. Our review covered 4 of the 14 power projects in USAID/Egypt's portfolio managed by its Development Resources Directorate, Power and Telecommunications Office. These included a hydroelectric power plant in Aswan, a combined cycle gas/steam power plant near Helwan (Cairo South), a gas turbine power plant in Hurghada, and a Power Sector Support project in various locations throughout Egypt.

To identify our universe of commodities and spare parts for these four projects, we reviewed a mission accounting report identifying (1) contracts under which equipment was procured, and (2) letters of commitment under which spare parts were procured. We included in our universe 7 host country contracts, one direct contract, and 18 letters of commitment.

We limited our conclusions to the items actually tested. That is, we did not attempt to project the results of our tests to the universe of plants built and spare parts purchased with USAID financing.

Our conclusions concerning the USAID/Egypt's monitoring of the adequacy of storage and maintenance support was based primarily on a review of site visit reports and contractor progress reports, tests of inventory and maintenance controls, and observations of controls in place at various plants and facilities visited.

We conducted an assessment of USAID/Egypt's system of internal controls for ensuring the adequacy of maintenance and storage support for commodities financed by USAID. More specifically, we assessed the adequacy of USAID/Egypt's site visits and contractor progress reports in identifying and resolving problems with maintenance and storage support. To perform our assessment, we obtained an understanding of the internal control structure, determined if controls were put in place, and assessed control risk.

Methodology

To meet this audit objective, we evaluated the adequacy of maintenance support at three power plants and storage support in warehouses at six locations.

In assessing maintenance support, we determined if (1) selected contracts specified whether or not maintenance training, spare parts, and maintenance plans were to be provided; (2) maintenance training and spare parts had been provided; and (3) a maintenance plan existed at each plant. From the list of commodities being provided under contract, we selected a judgmental sample of primarily high dollar value items and determined if (1) manufacturers' manuals specified what maintenance should be conducted, at what interval, and how; and (2) maintenance conducted was being recorded in maintenance records.

In assessing the adequacy of storage support, we visited warehouses at the three power plants included in the audit, as well as the four locations (one of which was at one of the power plants) receiving the highest value of equipment on the Power Sector Support project. We visited warehouses to determine whether precautions had been taken to protect spare parts from threat of fire and theft, and whether parts were physically protected from the weather. We also examined controls to ensure that spare parts were accounted for. At the seven warehouse locations visited, we selected primarily high dollar items from among the paid invoices or lists of commodities received, and verified that the items had been received, recorded in the inventory register, accounted for in the annual physical inventory, and stored in a warehouse.

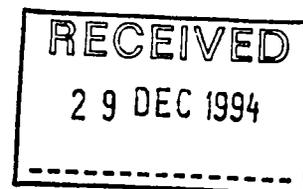
In reviewing the internal controls, we requested and reviewed copies of recent progress reports and site visit reports. For the two projects with active contracts, Aswan High Dam and Cairo South, we requested copies of all progress reports and site visit reports issued in 1993 and 1994 to date. For Hurghada, where the contract was completed in February 1992, we requested copies of all progress reports and site visit reports for its last 14 months. We reviewed these to determine whether they identified any maintenance or storage support problems, and then ascertained whether USAID/Egypt took appropriate action to correct any problems noted.

In reaching conclusions based on our tests, we considered exceptions exceeding 10 percent of our sample (by number) to be significant. We considered exceptions amounting to less than 10 percent to be insignificant. This threshold reflects our judgement concerning the degree of compliance that is practicable and achievable.



CAIRO, EGYPT

UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

MEMORANDUM

DEC 28 1994

TO: Timothy E. Cox, A/RIG/A/C

FROM: Duncan Miller, D/DIR *[Handwritten signature]*

SUBJECT: Audit of USAID/Egypt's Commodities Procured for Power Projects - Draft Report

Mission has no comments to offer at this time on the subject Draft Report. Please issue the final report.

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APPENDIX III

REPORT DISTRIBUTION

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