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PROJECT PERFORMANCE AUDIT REPORT

**SYRIA: FIRST AND SECOND MEHARDEH THERMAL POWER PROJECTS
(LOANS 986-SYR AND 1144-SYR)**

October 15, 1984

Operations Evaluation Department

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PROJECT PERFORMANCE AUDIT REPORT

SYRIA: FIRST AND SECOND MEHARDEH THERMAL POWER PROJECTS
(LOANS 986-SYR AND 1144-SYR)

PREFACE

This report presents the results of a performance audit of the First and Second Mehardeh Thermal Power Projects (which became in effect Stages I and II of one project), for which Loan 986-SYR of US\$25.0 million plus a supplementary loan of US\$8.6 million, and Loan 1144-SYR of US\$72.0 million was made to Public Establishment for Electricity (PEE) in May 1974, June 1975 and July 1975, respectively.^{1/} The first loan was almost fully disbursed and closed in March 1982, while the second loan, of which an amount of US\$3.7 million was cancelled, was closed in December 1983. Cofinancing of US\$33.0 million equivalent for the first project was provided by the Kuwait Fund.

The report consists of a Project Performance Audit Memorandum (PPAM) prepared by the Operations Evaluation Department (OED) and a Project Completion Report (PCR) prepared by the Europe, Middle East and North Africa Regional Office. In preparing the PCR, the Region took into account the findings of a project completion mission carried out by its project staff in February 1983. OED staff has reviewed the PCR, the Appraisal and the President's Reports, the loan documents, the minutes of the Board discussions and other documents in Bank files, and discussed the project with Bank staff.

The audit generally agrees with the PCR's coverage on the background, implementation and outcome of the project. The audit, however, in addition to providing a Highlights and a Project Summary, also provides Supplementary Comments wherein it extends the discussions on the financial aspects of PEE and on the role of the Bank, and presents additional conclusions and lessons which emerged from the project experience.

Following standard OED procedures, copies of the draft PPAR were sent to the Borrower for comments. Comments were received and they have been taken into account in completing the PPAR and are reproduced as Appendix A to the PPAM.

^{1/} A third loan (1531-SYR) to PEE for the Regional Electrification Project was signed in May 1978.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

SYRIA: FIRST MEHARDEH THERMAL POWER PROJECT
(LOAN (986-SYR))

KEY PROJECT DATA

<u>Item</u>	<u>Appraisal/a</u> <u>Estimate</u>	<u>Actual</u>
Total Project Cost (US\$ million)	100.9	109.2
Overrun (%)	-	8.2
Loan Amount (986-US\$25.0 million + 986/1-US\$8.6 million)	25.0	33.6
Disbursed	-	33.5
Cancelled	-	0.1
Joint financing - Kuwait Fund (KD 9.9) (US\$ million equivalent 1974)	-	33.0
Date for Completion of Physical Components	06/78	06/79
Proportion Completed by above Date (%)	-	99
Proportion of Time Overrun (%)	-	25
Incremental Financial Rate of Return (%)	17	/b
Financial Performance	-	Seriously deficient/c
Institutional Performance	-	Deficient/d

Cumulative Estimated and Actual Disbursements
(US\$ millions)

As of December 31	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
(i) Appraisal Estimate	3.1	9.4	17.2	28.1	32.0	33.6	33.6	33.6	33.6
(ii) Actual	-	3.6	14.3	26.3	30.7	33.1	33.3	33.4	33.5/e
(ii) As % of (i)	0	28	83	94	96	98	99	100	100

OTHER PROJECT DATA

<u>Item</u>	<u>Original</u>	<u>Revisions</u>	<u>Actual or</u> <u>Est. Actual</u>
First Mention in Files or Timetable	-	-	01/05/72
Government's Application	-	-	12/03/72
Appraisal	-	-	05/73
Reappraisal/f	-	-	02/74
Negotiations	10/73	-	01/74
Board Approval	12/73	-	04/16/74
Loan Agreement Date (986-SYR)	-	-	05/23/74
Amending Loan Agreement Date (986/1-SYR)	-	-	06/04/75
Effectiveness Date (986-SYR)	11/23/74	-	01/30/75
Effectiveness Date 986/1-SYR	-	-	01/19/76
Closing Date	06/30/79	09/30/80 12/31/81	04/30/82
Borrower, Executing Agency	Etablissement Public de l'Electricité (Public Establishment for Electricity)		
Fiscal Year of Borrower	January 1 - December 31		
Follow-on Project Name	Second Mehardeh Thermal Power Project (Loan 1144-SYR)		
Loan Number	986-SYR (US\$25 million) 986/1-SYR (US\$8.6 million)		
Loan Amount (US\$ million)	25 + 8.6 = 33.6		
Loan Agreement Date	05/23/74		
Credit Agreement Date	06/04/75		

MISSION DATA

<u>Item</u>	<u>Month/ Year</u>	<u>No. of Weeks</u>	<u>No. of Persons</u>	<u>Man- Weeks</u>	<u>Date of Report</u>
Pre-appraisal	01/72	0.5	1	0.5	03/06/72
Orientation	10/72	1.0	2	2.0	11/30/72
Pre-appraisal 2	02/73	0.25	2	0.5	02/23/73
Preparation	03/73	0.5	1	0.5	03/29/73
Appraisal	05/73	2.5	3	7.5	06/08/73 (Issues)
Post appraisal	11/73	1.0	1	1.0	12/21/73
Negotiations (Paris) and reappraisal	1-2/74	2.0	2	4.0	02/74 (date n.a.)
Total				16.0	
Supervision I	06/74	1.0	1	1.0	01/07/74
Visit consultants (Paris)	09/74	0.5	1	0.5	n.a
Supervision II	12/74	0.6	3	2.0	01/13/75
Supervision III	08/75	3.0	1	3.0	09/30/75
Supervision training	04/76	1.0	1	1.0	05/11/76
Supervision IV	05/76	1.0	1	1.0	06/30/76
Supervision V	06/76	1.0	1	1.0	08/30/76
Supervision VI	10/76	1.0	2	2.0	11/08/76
Supervision VII	05-06/77	0.7	4	3.0	06/22/77
Supervision VIII	06/78	1.0	3	3.0	06/30/78
Supervision training	09/78	1.0	1	1.0	10/26/78
Supervision IX	02/79	1.0	2	2.0	03/05/79
Supervision X	05/80	2.0	2	4.0	06/09/80
Supervision XI	12/80	1.0	2	2.0	01/20/81
Supervision XII	02/81	1.0	0.5	0.5	03/12/81
Supervision XIII	02/82	2.0	2	4.0	03/31/82
PCR	02-03/83	3.0	2	6.0	
Total Staffweeks:				35.0	

COUNTRY EXCHANGE RATE

<u>Name of Currency (Abbreviation)</u>	<u>Syrian Pound (£S)</u>
Years:	Official Exchange Rate:
Appraisal Year Average (1974)	£S1 = US\$0.260
Intervening Years Average 1975	£S1 = US\$0.272
1976-78	£S1 = US\$0.253
Completion Year Average 1979	£S1 = US\$0.253

- /a After Board presentation and receipt of bids on the project's major component, and in the wake of the Middle East war and sudden rise on oil prices, the bid prices received were far in excess of estimates. By an amending agreement, the Loan was increased by US\$8.6 million and only the revision (prepared under Loan 1144-SYR for the Mehardeh II project) is used here.
- /b Financial benefits, up to the present, have always been less than cost, i.e., the rate of return is negative.
- /c Although a tariff increase of about 50% was implemented in July 1980, PEE's financial position has continued to deteriorate. Its rate of return on assets in operation was negative in 1982; the operating revenues in that year were only 71% of operating expenses.
- /d Organization, administration, accounting and planning are unsatisfactory and do not meet the minimum requirements of a rapidly developing power company of the size of PEE.
- /e US\$117,837.64 undisbursed was cancelled from the Loan.
- /f In the aftermath of the 1973 Middle Eastern war, the power station part of the project was resited from Banias on the coast of the Mehardeh reservoir on the Orontes river, which required reappraisal.

PROJECT PERFORMANCE AUDIT BASIC DATA SHEET

SYRIA: SECOND MEHARDEH THERMAL POWER PROJECT
(LOAN (1144-SYR))

KEY PROJECT DATA

<u>Item</u>	<u>Appraisal Estimate</u>	<u>Actual</u>
Total Project Cost (US\$ million)	89.4	97.0
Overrun (%)	-	8.5
Loan Amount (US\$ million)	58.0	72.0
Disbursed	-	65.5/a
Cancelled	-	3.7/b
Joint Financing	-	-
Date for Completion of Physical Components	06/79	12/82/c
Proportion Completed by above Date (%)	-	98/c
Proportion of Time Overrun (%)	-	75/c
Incremental Financial Rate of Return (%)	12	7/d
Financial Performance		Seriously deficient/e
Institutional Performance		Deficient/f

Cumulative Estimated and Actual Disbursements
(US\$ millions)

As of December 31									<u>Forecast</u>	
	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
(i) Appraisal Estimate	8.0	29.0	55.0	69.0	72.0	72.0	72.0	72.0	72.0	72.0
(ii) Actual	-	12.3	31.2	41.2	49.5	60.7	64.8	65.5	67.5	68.3/g
(ii) As % of (i)	0	42	57	60	69	84	90	91	94	95

OTHER PROJECT DATA

<u>Item</u>	<u>Original</u>	<u>Revisions</u>	<u>Actual or Est. Actual</u>
First Mention in Files or Timetable	-		01/05/72
Government's Application	-		12/03/72
Appraisal	-		12/74
Negotiations	04/75		05/75
Board Approval	06/75		06/17/75
Loan Agreement Date	-		07/18/75
Effectiveness Date	01/19/76		01/19/76
Closing Date	06/30/80	12/31/83 12/31/81	12/31/83
Borrower, Executing Agency	Etablissement Public de l'Electricité (Public Establishment for Electricity)		
Fiscal Year of Borrower	January 1 - December 31		
Follow-on Project Name	Regional Electrification Project (Loan 1531-SYR)		
Loan Number	1144-SYR		
Loan Amount (US\$ million)	72		
Loan Agreement Date	07/18/75		

MISSION DATA

<u>Item</u>	<u>Month/ Year</u>	<u>No. of Weeks</u>	<u>No. of Persons</u>	<u>Man- Weeks</u>	<u>Date of Report</u>
Appraisal	12/74	2.0	3	6.0	01/13/75
Total				6.0	
Supervision I	05/76	1.0	1	1.0	06/30/76
Supervision II	06/76	1.0	1	1.0	08/30/76
Supervision III	10/76	1.0	2	2.0	11/08/76
Supervision training	04/76	1.0	1	1.0	05/11/76
Supervision IV	05-06/77	0.7	4	3.0	06/22/77
Supervision V	06/78	1.0	3	3.0	06/30/78
Supervision training	10/78	0.5	1	0.5	10/26/78
Supervision VI	02/79	1.0	2	2.0	03/05/79
Supervision VII	05/80	2.0	2	4.0	06/09/80
Supervision VIII	12/80	1.0	2	2.0	01/23/81
Supervision IX	02/81	1.0	0.5	0.5	03/12/81
Supervision X	02/82	2.0	2	4.0	03/31/82
PCR	02-03/83	3.0	2	6.0	
Total Staffweeks:				30.0	

COUNTRY EXCHANGE RATE

<u>Name of Currency (Abbreviation)</u>	<u>Syrian Pound (£S)</u>
Years:	Official Exchange Rate:
Appraisal Year Average (1974)	£S1 = US\$0.260
Intervening Years Average 1975	£S1 = US\$0.272
1976-78	£S1 = US\$0.253
Completion year average	£S1 = US\$0.253

- /a Loan not yet closed - outstanding are procurement of equipment and materials for expansion of existing substations and continuing consultant services.
- /b An amount of US\$3.7 million was cancelled by the Bank as of September 30, 1982 due to misprocurement.
- /c This date and proportion completed are only indicative. The Mehardeh II unit came on line in December 1979. Although substations suffered many delays and construction of one has been deferred (although equipment etc., is in stock), all (except the one not built) are in operation. Savings will be applied to further expansion and the original project can - physically - be considered almost (98%) complete. The resulting proportion of time overrun (75%) is therefore meaningless.
- /d Financial benefits, up to the present, have always been less than cost, i.e., the rate of return is negative.
- /e Although a tariff increase of about 50% was implemented in July 1980, PEE's financial position has continued to deteriorate. Its rate of return on assets in operation was negative in 1982; the operating revenues in that year were only 71% of operating expenses.
- /f Organization, administration, accounting and planning are unsatisfactory and do not meet the requirements of a rapidly developing power company of the size of PEE.
- /g US\$117,837.64 undischursed was cancelled.

PROJECT PERFORMANCE AUDIT REPORT

SYRIA: FIRST AND SECOND MEHARDEH THERMAL POWER PROJECTS
(LOANS 986-SYR AND 1144-SYR)

HIGHLIGHTS

The two projects constituted the first and second operations of the Bank Group in Syria's power sector. Their main components were a steam power station, several substations, an office building, staff training and several studies related to institutional development, organizational efficiency and future development programs. The Kuwait Fund cofinanced the first project (PPAM, paras. 1, 2 and 15; PCR, para. 2.10).

Some of the project components were modified and the estimated final cost of the first project was substantially higher than the appraisal estimate while the estimated final cost of the second project was only marginally higher. In order to cover the cost increase of the first project, the Bank and the Kuwait Fund provided supplementary loans. The implementation of the project components took substantially longer than scheduled. This delay, however, did not adversely affect utility operations because the growth in energy demand was slower than forecast (PPAM, paras. 3-5).

Some of the major objectives of the projects were achieved, albeit with delays, while others were not attained. Those that were achieved included reduction in the utility's fuel costs and improvements in and extension of supply to existing and new customers, respectively. The projects also contributed, through staff training, to the improvement of the utility's technical operations. The failures were related to the studies. With the exception of the third project, i.e, the Regional Electrification Project (Loan 1531-SYR) which evolved from the rural electrification study, the projects failed almost totally to achieve the long-term planning and the other institutional objectives, even though most of the relevant studies were carried out. The failure to achieve these objectives may have been due to a lack of interest or commitment on the part of PEE and the Government, or due to lack of implementation capacity on the part of PEE. The audit questions whether a sequential or a staggered approach to these studies might have had a better chance of achieving some of the objectives (PPAM, para. 27).^{1/}

^{1/} A third loan (1531-SYR) to PEE for the Regional Electrification Project was signed in May 1978.

The financial performance of the utility deteriorated drastically during the project period because the government did not approve adequate tariff increases which were necessary to meet rising operating costs. In fact, the operating revenues were less than the operating costs through most of that period; in 1981 and 1982, the revenues were short of even the cash operating expenses (PPAM, para. 9). The recalculated incremental financial rate of return on the project is negative (PCR, paras. 7.02-7.03).

There was a condition of default on the financial covenants (as well as on some non-financial ones) through most of the project period (PCR, Annex 1). Even though the Bank softened somewhat the financial covenants under Loan 1531-SYR, the default persisted through 1983. Furthermore, during the later part of the project period, the Bank proposed alternative financial performance targets, which appear to be more attuned to the Government's social and other objectives towards the sector but, so far, without an adequate response from the Government (PPAM, para. 24, 25).

During the latter part of the second project period, Bank supervision efforts on these projects, as well as on projects in other sectors, declined because of the cooling of the dialogue between Syria and the Bank, of staff constraints within the Bank, and of a perceived sense of futility within the Bank to induce PEE towards achieving the institutional goals that may have contributed to the lack of progress on institutional development. (PPAM, paras. 22; PCR, para. 8.01).

The following additional points may be of special interest:

- several factors, including PEE's difficulty in adhering to Bank's guidelines on procurement, contributed to delays in the completion of the project (PPAM, para. 4; PCR, paras. 3.01-3.02);
- rapid increase in prices of equipment following the oil crisis and the unsettled political situation in the Middle East in 1973 contributed to the increase in cost of the first project (PPAM, para. 4; PCR, paras. 2.03-2.04);
- inadequate investment in the distribution system plus other factors, including pilferage, contributed to substantial increase in system losses (PPAM, para. 6; PCR, para. 4.04 (ii));
- the 230-kV interconnection built to transfer energy between the power utilities in Syria and Jordan stands virtually idle (PPAM, para. 6; PCR, para. 3.13); and
- the experience from this project indicates the need for involvement of other project divisions of the Bank during appraisal of projects with multi-sector components (PPAM, para. 26).

PROJECT PERFORMANCE AUDIT MEMORANDUM

SYRIA: FIRST AND SECOND MEHARDEH THERMAL POWER PROJECTS
(LOANS 986-SYR AND 1144-SYR)

PROJECT SUMMARY

1. The two loans were the first and second operations of the Bank Group in the country's power sector. They supported in essence one project carried out in two stages, and which was part of the sector's long-term development program. The main components of the projects were the construction of a steam power station with two 125-MW units, an office building in Damascus, a 21-km heated fuel oil pipeline, construction and or extension of several substations, and staff training and several studies related to institutional development and organizational efficiency of the Borrower and to future development programs.

2. The main objectives of the projects were to reduce the utility's fuel costs by substituting the generation from gas turbine plants with that from the steam power plant, to improve the quality of service, and to meet the growth in energy demand. Other important objectives were to improve the organization efficiency and to carry out institutional reforms in the sector, through the introduction of such measures as planning and accounting systems, an appropriate tariff structure, and staff training.

3. Some changes were made to the projects notably: the steam units were increased in capacity to 150 MW, a railroad spur was constructed and 80 tankers supplied to transport fuel oil, and the office building, though retained as part of the second project, was not financed from the Bank loan due to misprocurement (PCR, paras. 2.12-2.15). The railroad spur and tankers were a superior alternative to the heated pipeline originally intended to transport fuel to the power station, which apparently was adopted without the benefit of an appropriate economic analysis.

4. The implementation of the projects took longer than expected due to several factors including the Borrower's difficulty in adhering to Bank's guidelines on procurement, sub-par performance of subcontractors associated with civil works, longer time taken by other government agencies in carrying out works complimentary to the project, bureaucratic obstacles in the country, and problems with supply of equipment and materials arising from unsettled political conditions in neighboring countries, (PCR, paras. 3.01-3.02).^{1/} The steam units were completed around 20 months behind schedule and have been operating satisfactorily but concern has been expressed in the PCR (para. 4.03) that they may face problems in the future due to the

^{1/} The Borrower observed that, nevertheless, a big effort was made by PEE to keep the delay to the minimum.

difficulty in obtaining spare parts because of bureaucratic constraints.^{2/} The substations had similar delays (though some of these were in operation before they were completed), and one substation and the office building has yet to be completed. The estimated final cost of the first project was substantially higher than the appraisal estimate due to several factors, including the rapid increase in prices of equipment following the oil crisis, the unsettled political situation in the Middle East, underestimation of import duties and taxes and greater than expected content of civil works (PCR, paras. 2.03-2.04). In order to cover these cost increases, which became known after the first loan had been approved, the Bank provided a supplementary loan of US\$8.6 million while the Kuwait Fund increased its loan by US\$15.0 million equivalent to US\$33.0 million equivalent (PCR, paras. 2.05, 2.07). The estimated final cost of the second project, after excluding the cost of the head office building, was only marginally higher than its appraisal estimate. (PCR, paras. 3.17-3.27).

5. Largely because the level of expected growth in sales of energy to industrial and irrigation consumers did not materialize (sales to the domestic consumers^{3/} appeared to be substantially higher than projected), the utility's total sales of energy throughout the project period were lower than those forecast (PCR, para. 4.04). The delays in the completion of the power station did not, therefore, adversely affect PEE's ability to meet the growth in energy demand (PCR, para. 3.02).

6. While the operating performance has improved, the system losses, which were reasonable and around 15% in 1974-76, have deteriorated significantly and presently they are around 33%. This deterioration is due to inadequate investment in the distribution system, which has not kept pace with the investments in generation and transmission, and is also attributed to other factors including possible pilferage (PCR, para. 4.04 (ii)).^{4/} The 230-kV transmission line built around 1980 to transfer energy between PEE and the power utility in Jordan presently stands virtually idle since neither country has felt the need to get the benefits, perhaps due in part to the prevailing differences between them. Another 230-kV transmission line interconnecting PEE with a power utility in Lebanon was awaiting the completion of a substation (PCR, paras. 3.13-3.14).

^{2/} The Borrower commented that PEE had not faced bureaucratic problems obtaining spare parts.

^{3/} Energy sales to domestic and commercial consumers are lumped together in the PCR; therefore, it is not possible to determine the precise amount of domestic sales.

^{4/} The Borrower noted that the loss figure included auxiliary power consumption and power provided free to mosques and churches, aggregating 8%, that is, one fourth of the 33% figure.

7. The project achieved, albeit with delay, some of its major objectives, i.e., reduction in the utility's fuel costs, and improvement in the power supply to existing customers and extension of supply to new customers. However, the project almost totally failed to achieve the institutional and long-term planning objectives.

8. The envisaged staff training and studies were carried out but apparently, there was a general lack of interest in the objectives of most of the studies. The recommendations of the consultants carrying out these studies were not implemented (PCR, paras. 3.07-3.09), and the net outcome of the studies, in terms of improvements in the institutional development and organizational efficiency, was minimal and considerably short of the appraisal expectations. Whatever improvement took place was mainly in the technical operation of the utility and that was largely due to the training of the technical staff to manage the power stations. The audit questions the depth of the institutional aspects of the project appraisals which should have determined whether the objectives, although accepted by the Government and PEE, were truly in accord with the social and other objectives of the Government and the priorities or capabilities of PEE.^{5/}

9. The financial performance of the utility deteriorated drastically during the project period and did not meet the requirements of the covenants in the loan agreement nor the somewhat relaxed requirements of the supplemental letter of May 3, 1978. That was because the government did not approve adequate tariff increases in order that they could meet rising operating costs.^{6/} In fact, the operating revenues were less than the operating costs through most of that period; in 1981 and 1982, the fuel bill alone was about 85% of the revenues from sales of energy. Moreover, the utility's average tariffs have been declining in real terms, and in 1982, they were lower than even the unit cost of heavy fuel oil for generating

^{5/} Bank staff disagree with this comment. They argue that when the Government accepted the objectives, it would have been inappropriate for the Bank to question whether the objectives were truly in accord with the social and other objectives of the Government and the priorities or capabilities of PEE.

^{6/} It is pertinent to note that in the case of Syria - First and Second Damascus Water Supply Projects (Credit 401-SYR and Loan 1241-SYR), the Project Completion Report No. 4823 dated December 14, 1983 points out that: (a) the financial performance of the project entity had deteriorated significantly during the last three years (1980-1982) of the project period because of the government's delay in approving tariff increases; and (b) a sewerage project which had been prepared for Bank Group financing was shelved after it had been appraised for lack of sufficient government commitment to cost recovery and institutional reforms acceptable to the Bank Group. In addition, a second telecommunications project, was appraised in 1979, but never reached the stage of negotiations because of tariff issues. In the recent years, however, the financial performance in the telecommunications sector has improved.

electricity from thermal plants. Necessary information has, however, not been available to the audit in order to determine whether the seemingly large increase in domestic consumption arose from the replacement of traditional fuels (e.g., kerosene, coal products) by electricity for domestic heating and cooking. The recalculated incremental financial rate of return on the project is negative (PCR, paras. 7.02-7.03).

10. Bank supervision of the projects had less than satisfactory results. It had limited success in helping PEE overcome problems which are generally typical with new and with institutionally weak borrowers, e.g., adherence to procurement guidelines, terms of reference and subsequent supervision of consultants. In the latter part of the project period, supervision of the projects declined because of the cooling of the dialogue between the Bank and the Government (PPAM, para. 22).^{7/}

SUPPLEMENTARY COMMENTS

Financial Aspects of PEE

11. PEE's financial performance throughout the project period was generally unsatisfactory by any standards, and well below the appraisal projections and the requirements of the loan covenants. The loan agreements for the first and second projects required PEE to earn a return of 9% on revalued net fixed assets in operation, beginning in 1978 (PCR, paras. 5.03 and 5.04). These revenue covenants were relaxed somewhat through an amendment made when the third power loan (1531-SYR) was approved.^{8/} The amendment required a series of tariff increases to be effective on January 1 of the years 1979, 1980 and 1981 so that the 9% return would be earned beginning in 1981. An additional requirement was that the Government would make cash contributions to PEE in 1978, 1979 and 1980 to offset the decreasing percentages of the difference in PEE's revenues from tariffs at the 1977 levels and revenues from tariffs necessary to earn the 9% return. The supplemental letter provided further that: by September 30, 1978, PEE would submit to the Government a satisfactory progressive rate structure proposal; PEE would obtain the Government's approval for that proposal; and new rates, based on that proposal and PEE's annual review of revenue requirements, would be charged and collected, effective January 1, 1979.

12. PEE did submit its tariff proposals to the Government on schedule. The Government failed to take action; however, and as of January 1, 1979, a situation existed whereby PEE and the Government were in default on the revenue covenants of the first and second power loans, and it would not have

^{7/} The Borrower observes that full cooperation was given supervision missions.

^{8/} (Supplemental Letter dated May 3, 1978).

been appropriate to declare the third loan effective, even if the conditions of effectiveness had been met^{9/}, because there would have been an immediate condition of default on that loan as well. The above situation persisted for 18 months until July 1, 1980. During this period, there were six postponements of the latest date for effectiveness for Loan 1521-SYR and several approaches by the Bank to the highest levels of the Government to act on the revenue covenants in all three loans, or to propose alternatives to the previously agreed level and structure of tariffs and to the plans for financing the needs of the power sector.^{10/}

13. Finally, on July 1, 1980, new power tariffs, not very different from those originally proposed by PEE in 1978, were introduced and Loan 1531-SYR was declared effective, 20 months later than scheduled. Even with the new tariffs, the 1980 return on unvalued assets proved to be only about 6.5% (the return on revalued assets probably would have been negative) and the return, even on unvalued assets, was negative for 1981 and 1982 and, undoubtedly, for 1983 (PPAM, para. 8; PCR, para. 5.04 and Annex 8).

14. A reflection of the inadequacy of tariffs, PEE's fuel bill alone in 1982 was about 85% of the revenues from sales of energy, and its average tariff in that year was lower than even the unit cost of heavy fuel oil for generating electricity from thermal plants. In terms of demand for electricity, during the last few years, there appears to be a large increase in domestic consumption of electricity, in sharp contrast to only a limited increase in electricity consumption from other customer categories. The audit, however, does not have the necessary information in order to determine whether this seemingly large increase in domestic consumption is induced by the low electricity tariffs whereby electricity is used to replace the traditional fuels (e.g., kerosene, coal products) for heating and cooking.

15. Bank action on the default on the revenue covenants, as well as on several other covenants (PCR, Annex 1), deliberately avoided suspension of disbursements or cancellation of loans. The political and economic situations in Syria were uncertain, at best, and relations between the

^{9/} Action on tariffs had not been specified as a condition of effectiveness of Loan 1531-SYR. It became one, in effect, because of the dates established in the Loan Agreement and Supplemental Letter and delays in satisfying the actual conditions of effectiveness.

^{10/} Even since the power tariff issue came to a head (1978), the Bank has indicated several times to the Government that it understands the Government's social objective reflected in the subsidies to the power sector. The Bank also has invited the Government to present, as an alternative to the revenue covenants, a plan for mobilizing sufficient resources at the center from which the investment needs of the various sectors, including power, could be met. To date, no such alternative has been presented for the revenue producing public services in Syria (power and water supply), both of which have tariff problems.

Government and the Bank were difficult. The Bank sought to maintain and improve on a constructive dialogue with the Government on broader economic development issues, and did not wish to risk this effort by taking action which could be perceived to be the initiation of a confrontation over social objectives. As it was, the Bank took a stand on the tariff issue and pursued it consistently while being generous by agreeing to the several postponements of the latest dates for effectiveness of Loan 1531-SYR and by inviting alternative proposals.

The Role of the Bank

16. An important project objective was to carry out institutional reforms in the sector and to improve managerial and operational efficiency of the Borrower. The Bank had correctly identified several specific areas which needed attention or improvement, and the project provided for staff training and studies in the respective areas to be carried out by consultants. In addition, and mainly to improve the organizational efficiency, the Bank had supported the construction of a head office building in Damascus to house the staff of the utility which, until then, was housed in several buildings in various parts of the city.

17. Only the rural electrification study^{11/} and the staff training, (mainly technical training) achieved positive results. The outcome of the rest of the studies was negligible (PPAM, para. 8). The construction of the head office building was put off a few times, before a start was made and has not yet been completed (PPAM, paras. 3, 6 and 7).

18. By comparison, it should be noted that in the water supply sector in Syria, during approximately the same period, the results of institutional development efforts (although not the financial results) under the First and Second Damascus Water Supply Projects (Credit 401-SYR and Loan 1241-SYR) were rated as rather good (OED Report No. 4823). They were certainly better than those in PEE. The reasons for the seemingly large differences in the institutional results have not been analyzed, but the beneficiaries' commitment to objectives probably was a factor. Other factors could have been differences between the size of the institutions and the complexity of the operations in the two sectors (the power sector is much more complex) and the fact that the credit and the loan for the water supply were made to the Government while the power loans were made directly to a public enterprise.

^{11/} The successful outcome of the rural electrification study (Regional Electrification Project financed by Bank Loan 1531) could be attributed to the likelihood that its objectives were in accord with the Government's objectives and priorities; likewise, the successful outcome of the technical training could probably be attributed to the fact that the utility needed trained staff to carry out its enlarged operations, particularly the operation of the thermal plant constructed as part of these projects.

19. Another important objective which was not achieved was the development of PEE as a commercially viable entity. In this case, it would have been even more difficult for the Bank to assure in advance that the Government appreciated the implications of the revenue covenants and intended to take the necessary steps. When it became apparent that those steps would not be taken, or would be seriously delayed, the Bank appreciated the difficulties and, in order not to precipitate a crisis in the rather delicate relationship with Government and thus possibly undermine efforts to resolve what the Bank considered to be larger issues, the Bank adopted a pragmatic approach (PPAM, paras. 11-15).

20. The audit is not in a position to speculate on the relative merits of the results of the role the bank played with respect to the defaults on the revenue and other covenants, and what might had happened if the Bank had suspended disbursements, or cancelled the first two loans, or terminated the third loan. It is possible, however, that the repeated postponements of the latest date for effectiveness of the third loan (PPAM, para. 12) may have given the impression of a lack of firmness in the Bank's policies on the financial viability of public utility enterprises^{12/} - there are still problems with respect to tariffs, cost recovery and finances generally in the Syrian water supply sector as well as in the power sector.

21. In recent years, the Bank had been willing and has even taken the initiative to discuss with the Government alternative financial performance criteria (i.e., tariffs to be adjusted to the levels whereby operating revenues would at least be adequate to meet operating costs plus debt service requirements) which appears to be more attuned or more in consonance with the Government's social and other objectives within the framework of a centrally planned economy. So far, this approach has had no tangible results.

22. Supervision efforts on these projects had less than satisfactory results. During a critical part of the second project implementation period, Bank supervision of these projects, as well as those in the other sectors in Syria, generally declined because of the cooling of dialogue between the Government and the Bank (PCR, para. 8.01). The audit considers that this situation may have contributed to the lack of progress on institutional development. In addition, supervision had limited success in helping PEE to improve procedures and overcome procurement difficulties (including procurement and administration of consulting contracts), and no success in introducing measures (e.g., revised procedures for withdrawals from the loan accounts) with the objective of reducing the high financing charges levied to

^{12/} Bank staff disagree with this comment. They consider that the repeated postponements did convey to the Government the intended signal that the Bank was indeed firm in its policies on the financial viability of PEE, and that the Government ultimately implemented a 50% tariff increase in July 1980.

PEE by the National Bank.^{13/} Furthermore, according to the PCR, (paras. 3.05 and 3.18), Bank supervision missions overlooked that the project cost control was not continued after March 1981, either by the Borrower or his consultants, which led to the need for providing estimated (instead of actual) final costs of the project.

CONCLUSIONS

Conclusions and Lessons Learned

23. The projects achieved some of its major objectives, i.e., reduction in the utility's fuel costs and improvement in and extension of power supply to existing and new customers, respectively. They achieved negligible improvements in the areas of institutional development and organizational efficiency.

24. In these projects, as in several other projects reviewed by OED, the loan covenants, intended by the Bank to ensure a conventional level of financial performance from the utility, did not achieve the desired objective because the Government, even though a party to the loan agreement, did not approve appropriate tariff increases. However, the agreed level of financial performance under these projects, unlike in the other projects, did not appear to the audit to be particularly relevant or appropriate in a centrally planned economy where the prices are often distorted due to subsidies and controls on costs of inputs and prices of outputs, respectively. During the later part of the project period the Bank had been willing to discuss with the Government an alternative financial performance criterion, but so far without any tangible results. There is, however, no way of determining whether such an approach by the Bank during the earlier, rather than the later, part of the project period (when the Bank's influence in the country was higher) might have induced the Government and the Borrower to take the basic steps to arrest the deterioration in the financial performance of the Borrower.

25. As a generalization, there is probably no way to determine at the time of signing the loan agreement whether the parties concerned are committed towards achieving any of the agreed objectives and performance targets. The chances of achieving the agreed objectives and targets are small, however, when there is no real commitment by the Government and the Borrower.

26. But for the timely intervention of the consultants, a 20-km. heated pipe line would have been constructed to transport fuel oil to the power

^{13/} Bank staff disagree with this comment, stating that it was not the Bank's function to dissuade PEE from adopting one of the approved reimbursement procedures.

station, as envisaged at the project appraisal, instead of the more economical method of transporting by rail, which was eventually built (PCR, para. 2.13). This experience highlights the need for involvement and participation of other relevant project divisions of the Bank (in this case, transportation) during the appraisal of projects which have multi-sector components.^{14/}

27. The several studies, dealing mainly with institutional improvements and operational efficiency and carried out by the Borrower through the use of consultants, achieved little benefits to the Borrower. The audit is in no position to determine whether the outcome of the studies was due to lack of interest or commitment on the part of the Borrower or the Government or whether the Borrower's managerial resources were already extended by the day-to-day operations and by the on-going physical expansion of the plant. A question also arises whether a sequential or at least a staggered approach to these studies might have had a better chance of achieving some of the envisaged objectives.

28. The experience from these projects also bears strong relationship to an important lesson which has been expressed in OED's Sixth and Seventh Annual Review of Project Performance Audit Results: institutional change takes time to show results and requires careful planning and realistic targets which take into consideration the priorities of the Government and the utility, and the staffing and other constraints peculiar to the country and the agency. Furthermore, institutional changes usually have to be approached in a phased manner over a period of time which is generally longer than that encompassed by one or two projects.

Sustainability

29. To improve, or even sustain the benefits derived from the project, an adequate supply of spare parts as required for proper operation and maintenance should be obtained, which requires removal of bureaucratic obstacles to procurement (PCR, para. 4.03). Also, recommended institutional reforms required to improve the efficiency of planning and administration of the power sector are required to reduce wasteful use of scarce resources (PCR, para. 7.01).

^{14/} However, the Borrower observes that the recommendation to provide a pipeline came from a consulting study financed by the loan.

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COMMENTS FROM THE BORROWER

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SYRLEC 411056SY

SYRLEC 411056SY

TLX NO 1046/T DATED 2/8/84

SUBJECT: PROJECT REPORT FOR LOANS 986/SYR AND 1144/SYR
ON SYRIA POWER I AND II MEHARDEH THERMAL PROJECTS.

ATT. MR. SHIV S. KAPUR

OED
Notes:

WE HAVE RECEIVED YOUR ABOVE MENTIONED REPORT AND WOULD LIKE
TO COMMENT AS FOLLOWS:

- 1 - THE REPORT HAS INDICATED THAT ORGANIZATION, ADMINISTRATION, ACCOUNTING AND PLANNING ARE UNSATISFACTORY IN PEE, BUT IT SHOULD BE CLEAR THAT THE REASON FOR THAT IS COMING FROM THE SHORTAGE OF HIGHLY QUALIFIED PERSONNEL WHO ARE LOOKING FOR BETTER OPPORTUNITIES ABROAD. Footnote added to PCR para. 6.01
- 2 - THE REPORT HAS INDICATED IN PAGE VIII THAT THE FAILURE TO ACHIEVE THE OBJECTIVES OF THE LONG TERM PLANNING WAS DUE TO LACK OF INTEREST ON CERTAIN COMMITMENTS. WE BELIEVE HERE THAT PEE DID ITS BEST TO IMPLEMENT THE STUDIES WHICH WERE CARRIED OUT AND SHOWED ALWAYS ITS INTEREST WITH THE EXCEPTION OF THE IMPLEMENTATION OF THE ADMINISTRATIVE MANAGEMENT IN PEE WHICH IS NOT YET COMPLETED DUE TO MANY DIFFICULTIES. Footnote added to PPAM Highlights p. viii
- 3 - IN THE PROJECT SUMMARY REPORT, IT WAS INDICATED IN PAGE 2 THAT THE RAILROAD TANKERS SOLUTION FOR FUEL OIL TRANSPORTATION WAS ADOPTED WITHOUT AN ECONOMIC ANALYSIS, WHILE THE FACT IS THAT PEE HAS ADOPTED THIS SOLUTION ACCORDING TO THE RECOMMENDATION OF THE CONSULTANT STUDY UNDER CONTRACT NO 718 WHICH WAS FINANCED ALSO BY LOAN 1144. Footnote added to PPAM para. 26
- 4 - IT IS INDICATED THAT EXECUTION OF PROJECT TOOK LONGER TIME THAN EXPECTED DUE TO SEVERAL FACTORS (PAGE 2) BUT WE DID NOT FIND ANY APPRECIATION OF THE BIG EFFORT WHICH WAS DONE BY PEE TO MINIMIZE THIS DELAY. Footnote added to PPAM para. 4
- 5 - IT IS INDICATED THAT THE SYSTEM LOSSES ARE PRESENTLY AROUND 33%. WE ASK YOU KINDLY TO CORRECT THE FIGURE BY UNDERSTANDING THIS FIGURE AS IT INCLUDES THE AUXILIARY CONSUMPTION IN THE POWER STATIONS AND SUBSTATIONS AND IT ALSO INCLUDES THE ENERGY CONSUMPTION USED BY MOSQUES AND CHURCHES IN THE COUNTRY. THESE BOTH CONSUMPTIONS MAY REACH 7-8%. Footnote added to PPAM para. 6

OED Notes

- 6 - IT WAS INDICATED THAT THERE WAS A GENERAL LACK OF INTEREST IN THE OBJECTIVES OF MOST OF THE STUDIES. WE BELIEVE THAT PEE WAS ALWAYS SHOWING INTEREST IN THE OBJECTIVES OF THE STUDIES. BUT ONE SHOULD CONSIDER PEE SITUATION FROM THE FOLLOWING SIDES:
- A - LACK OF QUALIFIED PERSONNEL WHO LEFT THE COUNTRY FOR BETTER INCOME.
- B - CONGESTED OFFICES AND DISPERSED BUILDINGS OCCUPIED BY PEE PERSONNEL.
- 7 - THE REPORT HAS INDICATED IN PAGE 5 THAT BANK SUPERVISION OF THE PROJECTS HAD LESS THAN SATISFACTORY RESULTS. WE HOPE THAT YOU ADMIT THAT PEE HAD OFFERED ALL ASSISTANCE AND COOPERATION TO ALLOW THE BANK SUPERVISORS TO CONTROL THE PROJECT AND BY PRESENTING ALL KIND OF AVAILABLE INFORMATIONS REQUIRED BY THE DIFFERENT MISSIONS.
- 8 - PEE HAD NOT FACED PROBLEMS CONCERNING OBTAINING SPARE PARTS DUE TO BUREAUCRATIC CONSTRAINTS AS WAS MENTIONED IN THE PAGE 2.
- 9 - WE DO NOT FIND THAT HAVING THE TRAINING INSTITUTE UNDER THE RESPONSIBILITY OF THE MINISTRY AND NOT UNDER PEE, IS COUNTER TO THE DEVELOPMENT OF PEE, SINCE THIS INSTITUTE HAD GRADUATE HUNDREDS OF TECHNICIANS OPERATING THE POWER STATIONS AND SUBSTATIONS IN A GOOD MANNER.
- 10 - PEE MADE A BIG EFFORT TO FINISH THE ACCOUNTS AND AUDIT REPORTS AND COULD ISSUE THE ACCOUNTS AUDITED FOR THE YEARS TILL 1981, WHILE THAT FOR 1982 IS IN IN THE FINAL STAGE. THE ACCOUNTS AND AUDIT REPORTS FOR 1983 IS SCHEDULED BEFORE THE END OF THIS YEAR. WE ASK YOU KINDLY TO STUDY THESE COMMENTS AND TAKE THEM INTO CONSIDERATION WHEN YOU FORMULATE YOUR CONCLUSIONS BEFORE THE REPORT IS DISTRIBUTED TO THE BANK'S EXECUTIVE DIRECTORS. WE THANK YOU FOR THE BIG EFFORT DONE TO PREPARE THIS REPORT.

Footnote added to PPAM Highlights p. viii

Footnote added to PPAM para. 10

Footnote added to PPAM para. 4

Footnote added to PCR para. 3.09

Footnote added to PCR para. 5.07

REGARDS, GENERAL DIRECTOR OF PEE, ENG. R. IDRIS

SYRIA
PROJECT COMPLETION REPORT
MEHARDEH I AND MEHARDEH II PROJECTS
(LOANS 986-SYR AND 1144-SYR)

I. INTRODUCTION

1.01 Prior to PEE's creation in 1965, the power sector in Syria was fragmented in various isolated systems, private and municipal. Since its creation, PEE has been responsible for generation, transmission and distribution of electric power throughout the country. However, mainly because PEE had concentrated on the technical problems of operating procedures and of integrating the numerous separate systems and plants into one system, the power sector organization in 1973 was still substantially regional and fragmented. The sector then stood in need of vital institutional reforms aimed at improving PEE's organization, including administration, accounting and planning and at achieving an economical and reliable service. Securing this objective required a combination of inter-related actions.

1.02 The two subject lending operations provided an opportunity for the Bank to assist PEE in trying to improve the organization of the sector in order to assure an economical and reliable service to the public.

1.03 This PCR is based on the appraisal reports and other documents in the Bank's files, a rather inadequate completion report prepared by the engineering consultants to PEE for the subject projects and on information obtained by a Bank mission from PEE in February-March 1983.

II. PROJECT PREPARATION AND APPRAISAL

Preparation of the Projects

2.01 In early 1972, the Bank decided to identify a power project suitable for Bank financing particularly in view of the institutional objectives that could be pursued under such a lending operation (paras 1.01 and 1.02), and several small missions during that year assisted in such identification.

2.02 A project comprising the first unit of a 2x125 MW steam-electric station at Baniyas on the coast where a refinery would be constructed, and several 230-kV substations, was appraised in May 1973 as a suitable first project for attaining part of the objectives. Bid documents for major items of power station equipment had already been issued at the time of appraisal but bidding could not be completed due to the 1973 Middle East War (October).

Appraisal

2.03 The 1973 Middle East war caused heavy damage to some 150 MW of PEE's generating plant. The reduction in generating capacity was, however, rapidly overcome with the installation of a large number of gas turbines, procured mainly with the assistance of other Arab states. Because of their high cost

of operation, there was a great urgency to replace these gas turbines with new, efficient plant and the Bank moved ahead expeditiously with negotiations (January/February 1974) even when the Government indicated that, for security reasons, it had decided to resite the power station inland. The only location where cooling water could be assured was near the Mehardeh reservoir. (This resiting affected only the technical aspect of the project). The project was reappraised in February 1974 immediately following the negotiations. It was fully realized that the resiting not only would raise the estimated cost of the power plant significantly (at least 10% in addition to increases in cost of civil works) but would also introduce an element of increased risks, because the new site had been only cursorily surveyed. It was assumed that the increase in local cost would be covered by a contingency allowance of 15%. A loan of \$25.0 million was quickly processed, with Board presentation in April and loan signing in May 1974. The Kuwait Fund with a loan of \$18.0 million was a cofinancier, jointly financing the foreign cost of the project amounting to \$43.0 million.

2.04 After the Bank loan was approved by the Board, it was reported to the Bank that the bid prices were far in excess of the estimates, resulting in an estimated foreign cost of some US\$83 million, compared with the original estimate of US\$43 million. The main causes of the increase were: (i) the rapidly rising world market prices of equipment as a result of the recent increase in oil prices which could not be anticipated at the time of reappraisal; (ii) concurrent changes in the parities of the bid currencies with the US dollar; (iii) a shift of local cost to foreign cost (i.e., the foreign cost proportion rose from an estimated 70 percent to 85 percent); and (iv) substantial premium charged by suppliers because of the increasingly unsettled conditions in the Middle East.

2.05 Evaluation of the bids was extremely difficult and caused some delays. The lowest evaluated bidder included in his bid a unit size of 150 MW, rather than the approximate size of 125 MW requested. This was financially advantageous because the unit cost was considerably less than those of the other bidders. The Bank also investigated the economic benefits of the larger unit size and concluded that the additional capacity could easily be absorbed in the system. (To cover the increased costs, the Bank increased its loan from \$25 million to \$33.6 million in June 1975, see para 2.07.)

2.06 Due to the above problems, the contract for the power station was only signed in November 1974, about 5 months late. It allowed PEE to exercise an option, within 6 months of effectiveness, to order a second unit (as bid concurrently with the first unit). It is noteworthy that the contract for the power station limited foreign escalation to 10 percent of the contract value. This limit was soon reached and thus the power station (first and second units) was completed at a firm foreign price of 110 percent of the base price, which was extremely advantageous for PEE.

2.07 The Kuwait Fund - which had not yet submitted its loan to its Board - indicated, as early as June 1974, that it would be willing to provide up to US\$15 million towards the cost overrun. In the course of appraisal (December 1974) of the Mehardeh II project (Loan 1144-SY, approved April 1975), the Bank decided to increase its loan of US\$25 million for Mehardeh I by adding a second tranche of US\$8.6 million. Thereafter the Bank, in effect, treated both projects as a single one, except for the fact that it desired to have a separation of costs for budgetary control. For this reason, although Loan 1144-SY has not yet been closed, the present report reviews performance under both projects together.

2.08 Annex 1 sets forth the major covenants of the Guarantee and Loan Agreements and the extent of compliance with these covenants. PEE's performance under the revenue covenant was far below appraisal expectations because of Government's unwillingness to raise tariffs in order to maintain PEE as a financially viable entity.

2.09 The second Mehardeh Thermal Project was appraised by the end of 1974. It comprised the second (150 MW) thermal unit at Mehardeh, additional substations, a new head office, and several studies (comprehensive energy review, possible use of natural gas, tariffs, village electrification) having the objectives of sound development of the sector, and extending service to the rural areas.

Description of Projects

- 2.10. Except that consulting services differed, both projects were substantially similar and complementary. They comprised:
- A. - The first (Mehardeh I) and second (Mehardeh II) 150 MW units of a steam electric station adjacent to the Mehardeh reservoir on the Orontes river.
 - B. - under the Mehardeh I project: 4 new 230-kV substations, respectively at Hamah, Tartous (for extending the grid to the coastal area), Raqqa and Meskene (in both cases primarily for irrigation purposes); and extension of the 4 existing substations at Aleppo, Homs (Kattineh) and Damascus (Midan 2, Kaboun 2);
 - under the Mehardeh II project: 6 new 230-kV substations, respectively at Deir ez Zor, Souedie, Hassakeh, Latakia, Adraa (No. 2, Damascus) and Meskene (No. 2); and extension of the 2 existing substations at Kaboun 1 (Damascus) and Meskene (No. 1, under construction under the first project);
 - C. - under the Mehardeh II project: construction of a new head office building at Damascus (preliminary design had already started under the first project).

D. Engineering services for both projects for preliminary design, preparation of bid documents and supervision of final design and construction; and

E. Consulting services as follows:

- under the Mehardeh I project: (i) a management and accounting study; (ii) a tariff study and (iii) training.
- under the Mehardeh II project: studies for
 - (i) energy assessment in the country;
 - (ii) use of natural gas in the Souedie area;
 - (iii) interconnection with neighboring countries;
 - (iv) regional (rural) electrification; and
 - (v) training, particularly for Mehardeh operating personnel.

2.11. Not forming part of either project, but in practice an integrated component of both, was the study and construction of a dispatch system, subsequently financed independently by an Abu Dhabi credit.

Changes in Project Scope

2.12 The Mehardeh power station was constructed substantially as planned without much change in the scope of the project and as a turnkey contract. A civil works problem of relatively large holes appearing in the karst subsoil was solved satisfactorily by grouting at minor cost. One design change was that rather than a fixed pumping station, a floating station was finally used to allow for the frequent, widely varying levels of the reservoir.

2.13 A major change was found necessary in the oil delivery arrangements. A 20 km long oil pipeline, originally included in the project, was excluded from the final contract for technical reasons: pumping heavy residual oil over this distance required heating facilities not provided in the bid documents. On further study it was found that the least cost--and technically the most simple--solution would be to construct a railway spur (also about 20 km long) between Hama and Mehardeh. This solution was finally adopted and 80 railway tankers were financed under the second loan.

2.14 All the substations under the two projects except two were completed substantially in accordance with the original design. The two exceptions were the Adraa (No. 2) substation near Damascus and the second substation at Meskene, both under the second project. Because the physical completion of most substations was considerably delayed (para 3.03), the urban area of Damascus that was intended to be served by the Adraa substation was considerably larger than previously planned. This more than doubled the size and cost of the substation. In a way the delays were beneficial because they allowed adaptation to rapidly changing supply conditions, as was shown in the case of the Adraa substation. The second substation, Meskene 2, intended primarily to supply power to irrigation projects, has not been executed so far

due to the uncertainties and delays in planning at the Ministry of Irrigation. In case no decision is taken by the Ministry before the end of 1983, PEE will use the equipment, which is now kept in stock, for a new substation for the Damascus area.

2.15 Another change relates to the head office building, one of the components of the second project. Although PEE had been spread out among numerous buildings in Damascus, for several years before Mehardeh II was appraised, the Government apparently was not convinced of the need for a new head office building for PEE; and by the time the need became more than obvious and the building was included in the project, the cost had quadrupled from what it would have been, say, five years earlier. The original design envisaged a phased investment on the argument that the building could be doubled in size, say, five years after completion. Subsequently, because of misprocurement (para 3.32), the Bank cancelled the relevant amount (US\$3.7 million) from Loan 1144-SYR on September 30, 1982. The building, presently estimated to cost some US\$35 million versus US\$8.7 million originally, is now being completed by PEE in stages depending on the amounts made available by the Government in various years.

2.16 Engineering and other consulting services were provided as planned, although PEE has so far not derived any significant benefit from the management and tariff studies (see paras 3.06 and 3.07).

III. IMPLEMENTATION OF THE PROJECTS

Implementation Schedule

3.01 The first unit at Mehardeh was scheduled for completion in the third quarter of 1977 and the second unit, six months later. In the event, the first unit was first connected to the network in April 1979, some 20 months late and the second unit in December 1979, some 22 months late. The reasons for the delay were:

- 5 months due to late contract signing (para 2.06);
- 12 months due to delays in reinforcing the Tartous-Mehardeh road by the concerned Government agencies; and
- 4-6 months due to various causes, such as: (i) the unsettled conditions in Lebanon which affected the supply of local equipment and materials, particularly slowing down civil works; (ii) delays in civil works construction due to the subcontractor's sub-par performance (a general problem in Syria which is partly due to lack of skilled and qualified personnel).

3.02 The delay caused no problem for PEE in meeting the demand mainly for three reasons: (i) actual demand lagged far behind the forecasts (para 4.04); (ii) the USSR-financed 800-MW Thawra hydro station on the Euphrates started operation in 1974, and has generated energy in excess of the appraisal estimates in part due to delays in irrigation projects; and (iii) PEE repaired all thermal plants damaged during the 1973 war and had for some time a reserve capacity exceeding 300 MW in gas turbines.

3.03 As regards the substations, those under Mehardeh I were on average one year late and those under Mehardeh II some three years late. However, most substations started partial operation approximately as contractually scheduled, although the various bays, control room and low tension facilities were completed late. No substantial difficulties appear to have been encountered due to the delays (except that reliability was lower than expected and forced outages were of longer duration) because most of the Government projects such as urban expansion, completion of factories and execution of irrigation schemes suffered similar delays. The main causes of the delays were the slow and unsatisfactory work of civil works subcontractors (some control buildings had to be rebuilt), insufficient supervision by the main contractor and unsatisfactory work practices which necessitated rectification measures before the substations could be taken over even provisionally, let alone finally. Tender documents for the last four substations took three years to complete. Rebidding became necessary and subsequently an award dispute arose with the Bank. One substation (Meskene 2) has still to be completed (para 2.14).

3.04 The construction of the new head office building did not start for a long time. The Government then decided that it would be built in stages and the contract for the first stage was awarded to a contractor not evaluated as the lowest bidder (see para 3.32 re misprocurement issue). PEE is dispersed over many offices quite distant from each other, making communications extremely time-consuming and difficult. Such a state of affairs in an office with cumbersome bureaucratic procedures as in PEE aggravates the problem of slow decision-making and low efficiency through poor communications and inadequate supervision.

3.05 Throughout the period of the loans, consultants have, in general, been inefficiently used and the considerable expenses incurred for their services substantially wasted, except in technical matters. From the beginning, an expatriate firm "A" was engaged for supervision and administration of the project. They executed their task until March 1981 when the Mehardeh power plant was completed and were replaced by new consultants "B". They were apparently instructed only to supervise and administer the remaining substation work under Mehardeh II and started on a "fresh" basis, not using the figures as presented by the previous consultants in their last Quarterly Report. Because they were also not instructed to continue collecting reporting information on items still outstanding, such as final payments, consultants' cost and PEE's own expenditures, there occurred a gap in the financial information, particularly for the second Mehardeh project. This caused additional difficulties in determining the final project cost

(para 3.17). Although the first supervising consultants have submitted a draft completion report, the report only discusses the Mehardeh power station, without any analysis of actual cost versus estimate (including PEE's own cost) and without providing information on the other parts of the project.

3.06 The management and accounting study (which in effect was financed in part by the first and in part by the second loan) was executed by an expatriate firm of consultants (firm "C") in 1975/76, but no action was taken by PEE to implement the proposals. The Bank's efforts at persuading PEE to commence implementation were of no avail until July 1980, when after prolonged negotiations, PEE engaged another expatriate firm (firm "D") to conduct yet another study. Again the firm was not required to complete the implementation phase. Completion of the study was delayed partly because PEE was unable to provide the necessary counterpart staff. At no time during the execution of the work did the consultants have more than an average of some 20% of the required counterpart staff. The Project Director was changed and there seemed to be a general lack of interest in introducing new procedures. PEE is now planning to appoint firm "D" on a new contract to implement the new systems and procedures and to train the accounting staff adequately.

3.07 A tariff study was conducted under Mehardeh I by an expatriate firm of consultants (firm "E") between September 1975 and May 1977. The study took so long because of the slowness of PEE's responses and the difficulty in obtaining the necessary data. In any event, no action was taken to implement the recommendations, because of the Government's unwillingness to increase the rates expeditiously (para 5.04).

3.08 Subsequent to the tariff study itself, the same firm also submitted (April 1978) a Load Research Study, complementing the tariff study, with the object of providing PEE with a tool for continuing a review of the tariff structure and of achieving an improved data bank for the necessary inputs. The recommendations were again not implemented.

3.09 In the initial stages of the Mehardeh I project, an expatriate firm "F" executed, with bilateral assistance, a training study for lower and middle level personnel. The study recommended the establishment of a new training center at Adraa. The Bank supported this proposal for an "Institut Moyen d' Electro-Mécanique" and sums of US\$0.25 million and US\$0.75 million respectively were included in the Mehardeh loans. About 170 technicians, 50 clerks and 230 foremen and supervisors were to be trained annually, reflecting PEE's forecast growth in manpower from about 9,700 in 1975 to 21,000 in 1980. Actually, PEE had only 14,000 employees by the end of 1980. The institute was also brought under the responsibility of the Ministry and not under PEE, which was counter to the objective of developing PEE as an autonomous agency of Government.^{1/} The Government was unwilling to vest the responsibility for the Adraa center in PEE and, as a compromise, agreement was reached that, at least for the first five years, all courses at the institute would be exclusively aimed at the training of PEE personnel. By 1977, construction at Adraa had not started and in view of the urgency to train people, particularly for the Mehardeh power station and the substations, PEE agreed with the Bank to create temporary facilities at the old power station at Hameh in Damascus. The

^{1/} The Borrower commented that it did not think having the Training Center under the jurisdiction of the Ministry rather than PEE was disadvantageous, as the Institute had done a good job.

amounts referred to above were used to procure training equipment for the temporary center at Hameh (later to be transformed to Adraa) and the permanent center at Adraa. Bilateral assistance provided expatriate specialists to install the equipment, produce curricula and initiate training courses.

3.10 The Adraa training center was finally completed in 1980 and by the end of the year about 400 trainees were attending courses. The effectiveness of the training for PEE's purposes (150 trainees graduate each year) is doubtful. After 6-12 months with PEE, many trainees have to leave for 30 months of compulsory military service; subsequently they return for an obligatory six years' total service with PEE. Not all return and the period in the army is not conducive to picking up old skills in PEE. Even so, the combined PEE and army training make many people attractive for private enterprises in Syria and elsewhere, where salaries are far in excess of what PEE - tied to low Government salaries - can offer. Although it was agreed that the training center would also train administrative and accounting personnel, the necessary curricula have never been set up. The long term effects are obvious in PEE: technical operations are on a far higher level of efficiency than administrative work. The problem is compounded by the fact that the administrative personnel as a group are considered to be a less important group, as seen from their remuneration.

3.11 Under the Mehardeh II project, the studies for energy, use of natural gas and interconnection were combined in a single study by Consultant "A" who submitted their final report in January 1978. The main recommendations were:

- (i) Construction of a gas treatment plant in two places and pipelines from these gas centers to a planned refinery, a power station and some thermoplastics and chemical factories. Along the route various existing gas turbines would burn gas for peaking and emergency purposes;
- (ii) Implementation of a long range plan of expansion of generating capacity at least cost; and
- (iii) Interconnection at 230 kV with Jordan, Lebanon and Turkey. By 1990, an overlying 400 kV grid could provide a second connection with Turkey and possibly also with Iraq. Benefits arise from shared resources and the non-coincidence of daily and seasonal peaks.

3.12 No project to exploit gas resources as recommended by the consultants has been initiated although the Bank had proposed financing an engineering (and gas confirmation) project. In the power sector, the first 2 units at Baniyas (175 MW rather than 150 MW each) as recommended by the consultants are being commissioned. A 400-kV line (to be operated initially at 230 kV) is being constructed (some 2-3 years late) between Adraa and Hama parallel to two existing 230-kV lines. Towers are in place and only conductors and hardware have still to be mounted.

3.13 At the time of appraisal of both projects, the Bank (IDA) was also assisting Jordan in the creation of a national power company and discussions between both countries resulted in PEE's assisting the fledgling (but very rapidly growing) company in Jordan in meeting the demand by the construction of a 230-kV line to Irbid in Jordan. The line was delayed and probably entered into operation in late 1979 or early 1980. Although minor amounts of energy have been transmitted, neither Syria nor Jordan apparently has felt the need for getting full operational benefits from the connection. It now stands virtually idle although, presumably, its general reserve function can still be exercised.

3.14 The 230-kV connection from Tartous to Tripoli in Lebanon is awaiting completion of a substation in Tripoli.

3.15 In preparation for the appraisal of the next Bank project (a regional electrification project) Consultant 'A' completed the feasibility study (under Mehardeh II) in September 1977. It covered all rural areas in Syria in order of economic merit. A project was defined and appraised on the basis of this report.

3.16 Under Mehardeh II, the Bank financed a team averaging 10 experts from a foreign utility which, together with contractor's personnel, trained on the job the necessary technicians and operating personnel for the Mehardeh power plant during commissioning and the first year of operations. This contributed significantly to the successful operation of the plant up to the present, because most of the employees - although having received some basic training at Adraa and at other PEE steam--electric plants--had never been exposed to a plant the size of Mehardeh.

Project Costs

3.17 Although an expatriate firm of consultants was appointed to supervise and administer the projects, it was not able to set up a satisfactory accounting and budget control system due to deficiencies in PEE's accounting system and the lack of information on PEE's own costs. The consultants were only able to keep an account of the expenditures under contracts, both in local and foreign currencies.

3.18 Computation of actual project costs has been complicated by the fact that after March 1981, project cost control was not continued, a fact which does not seem to have been noticed by the Bank supervision missions also. In computing the local costs, the consultants' estimates of PEE's own costs have been proportionately allocated to all local cost items of each project.

3.19 A comparison of the estimated and actual costs of Mehardeh I is given in Annex 2. The original estimate is also shown, but is not used for comparison because the amendment to the loan agreement reflects the cost estimate as revised in the appraisal report for Mehardeh II. Because the local costs of all contracts were adjustable in accordance with the cost of living increases but were converted by the consultants into US dollars at the official rate of exchange, local costs are also expressed in 1974 prices. The costs are summarized as follows:

Mehardeh I - Estimated vs. Actual Costs
(In US\$ Millions)

	<u>Revised Estimate</u>			<u>Actual Cost</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
Power Station	8.6	54.0	62.6	21.9	55.8	77.7
Substations	2.1	14.7	16.8	2.8	15.6	18.4
Consultants	0.8	3.8	4.6	0.3	3.4	3.7
Contingencies	4.0	12.9	16.9	-	-	-
Total	<u>15.5</u>	<u>85.4</u>	<u>100.9</u>	<u>25.0</u>	<u>74.8</u>	<u>99.8</u>
Railway Spur	-	-	-	3.9	-	-
Total Project Cost	<u>15.5</u>	<u>85.4</u>	<u>100.9</u>	<u>28.9</u>	<u>74.8</u>	<u>99.8</u>

3.20 Although the actual total cost of the project was within 1% of the (revised) estimate, the local costs were 86.5% more, and the foreign costs 12.4% less than the estimate. The variations occurred mainly in respect of the power station. At the time of appraisal, the risks were perceived to be high in view of the resiting of the station to a site which had not been surveyed adequately, which is obvious from the high level of foreign cost contingencies (contractor claims appeared probable). In practice, however, no undue difficulties were encountered, and additional contractors' claims were negligible. There are several reasons for the overrun in local costs: (i) At appraisal, the local cost under the contract (not yet signed) was not well known; the contract as finally signed had a local cost component of about US\$11.5 million equivalent in 1974 prices (US\$3 million above the estimate); (ii) PEE had to pay customs duties while at appraisal, information had been given that PEE was exempt from those duties; (iii) by having the reimbursement procedure for disbursements from the loan, PEE incurred extremely high costs in the financing charges levied by the National Bank; and (iv) the cost of the railway spur replacing the oil pipeline originally included in the project (US\$3.9 million allocated to Mehardeh I).

3.21 The actual cost of the first unit of the power station (US\$78 million) indicates a very favorable cost of about US\$520/kW (and US\$400/kW for the total power station, see below). The final cost of the engineering consultants was about equal to the estimate, although this may be misleading because of the basis of allocation of these costs between Loan 986-SYR and Loan 1144-SYR.

3.22 As regards the substations, in spite of the many delays and changes in detail, the actual cost remained reasonably close to the estimate. As regards consultant services other than engineering, the consultants executed the tariff study at a cost far below the estimate (about LS 15,000 thousands and some local cost) but this does not explain the low expenditures shown in Annex 2. Most likely, PEE paid the bills through the National Bank but did

not request reimbursement for the amount missing e.g. the consultants presently supervising substation construction under Loan 1144-SY have been paid directly by PEE since 1982, but no reimbursement request has yet reached the Bank.

3.23 As a result of the delays in setting up the temporary training school and the delay in completing the power station it appeared that Loan 986-SYR would be exhausted soon and, because Loan 1144-SYR appeared to result in savings, payments for training equipment and for the foreign experts who would train the Mehardeh personnel, were shifted to the latter loan.

3.24 A comparison of actual vs. estimated costs for Mehardeh II, prepared on the same lines as for Mehardeh I is shown in Annex 2. It should be realized that about US\$3 million (about 4%) remains to be disbursed for substation equipment and management consultants. However, this does not in any way affect any of the conclusions. The comparison is summarized as follows:

Mehardeh II - Estimated vs. Actual Costs
(In US\$ Millions)

	<u>Revised Estimate</u>			<u>Actual Cost</u> (Without Head Office)		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
Power Station	6.1	39.1	45.2	11.9	41.4	53.3
Substations	2.4	13.3	15.7	3.1	18.7	21.8
Head Office	3.0	3.1	6.1	-	-	-
Consultants, Training	1.8	5.6	7.4	2.7	9.3	12.0
Contingencies	4.1	10.9	15.0	-	-	-
Total	<u>17.4</u>	<u>72.0</u>	<u>89.4</u>	<u>17.7</u>	<u>69.4</u>	<u>87.1</u>
Railway Spur	-	-	-	1.3	-	-
Total Project Cost	<u>17.4</u>	<u>72.0</u>	<u>89.4</u>	<u>17.7</u>	<u>69.4</u>	<u>87.1</u>
Total Project Cost (excl. Head Office)	14.4	68.3	82.7	19.0	69.4	87.1

3.25 Since the Bank cancelled the amount of US\$3.7 million allocated to the head office, all costs related to the component have been eliminated from the actual cost of the project.

3.26 The foreign cost overrun is due to part of the cost of 80 railway tankers procured for transport of oil and the terminal unloading facilities at Mehardeh allocated to Mehardeh II (US\$3.5 million). The foreign cost overrun of the substations is largely due to the expansion of the Adraa 2 substation to meet the future network configuration requirements in the Damascus area. The total local cost overrun (US\$4.6 million) excluding the cost of the head office from the original estimate has been caused by PEE's own expenses on account of National Bank charges and customs duties, too low an estimate for local costs pertaining to the power station, and the cost of the railway spur.

3.27 The foreign cost for engineering and other consultant services (US\$9.3 million) exceeded the estimate (US\$5.6 million) by US\$3.7 million. About US\$0.5 million is due to the extended scope of the combined energy, gas and interconnection study. The cost of engineering and supervision exceeded the estimate by US\$2.3 million because on average the works have been delayed by some 2 years and most of the relevant costs were allocated to Mehardeh II. The consultants did not separate the cost of training equipment and the cost of the training experts for Mehardeh, both of which were shifted from Mahardeh I to Menardeh II. It appears that about US\$0.5 million of the foreign cost overrun of US\$0.95 million is due to this shift and the remainder was caused (i) by procurement of additional training equipment as a result of suggestions made by the Bank's training advisor and (ii) by the extended stay of some of the training experts for Mehardeh. The high local cost under training pertains to the local cost of the building and training facilities required for the temporary training center at Hameh.

Procurement

3.28 In general, there were many difficulties in procurement for the projects, of which the most important were: (i) misunderstanding or misinterpretation of the guidelines and (ii) coping with numerous bureaucratic obstacles. Even now, these problems persist presumably because of lack of experienced personnel, changes in such personnel, lack of a knowledgeable procurement officer fully responsible for all procurement, the requirement of final government approval and the wrong use of consultants who make recommendations but have little influence in making the final decisions.

3.29 In the case of the Mehardeh projects, these difficulties did not significantly impede execution, because, in essence there were only a few, very large contracts, which were signed at an early date, with the Bank staff playing a helpful role. The 5-month delay in award of the contract for Mehardeh (para 2.26) arose because bidding by prospective suppliers was incomplete and the analysis of the bids was extremely difficult.

3.30 The construction of 4 substations (not included in the option that could be exercised under the Meherdeh II project) had to be put out to tender. There was a long delay of some three years in preparation of the bid documents and a further delay of five months in resolving a disagreement between the Bank and PEE on the award of the contract.

3.31 The procurement of consulting services was, in most cases, a long drawn-out affair, giving the impression that PEE attached undue importance to cost rather than expertise. Working conditions within PEE were difficult and payments often overdue as was obvious in several instances where consultants requested Bank assistance to expedite matters.

3.32 The main procurement problem occurred for the head office building under Mehardeh II. The civil works were finally submitted to ICB and bids were opened in July 1980. However, the Bank initially did not receive the report on bid evaluation. As the Bank staff was informed, Government and PEE took the view that the cost was so high (in the order of US\$35 million) that budgetary constraints would not allow execution under a single contract. The

argument was questionable considering the hundreds of millions of dollars invested in other major power components. In the end, it was decided by the Syrian authorities--without consulting the Bank--that the building would be completed in stages as funds would become available, and accordingly a first contract was signed for the concrete skeleton with a local contractor who was not the lowest evaluated bidder. The Bank informed PEE that it did not deem the actions taken to be in accordance with the agreed procurement procedures, and cancelled the relevant amount of US\$3.7 million from the loan on September 30, 1982.

Disbursements

3.33 Due to the delays in executing the projects, disbursements lagged behind the estimates particularly for the Mehardeh II project. The situation was aggravated, however, by PEE arranging a large share of the payments through credit facilities of the National Bank of Syria, which involved long delays between payments and requests for reimbursement by the Bank and Kuwait Fund. Delays of up to half a year were not unusual.

3.34 Annex 3 shows the actual and forecast disbursements for Loan 986-SY (Mehardeh I). Except for the delay of about one year, the situation remained about constant (disbursements lagged behind the estimate by about US\$2 million) and at the original closing date of June 30, 1979, only US\$0.8 million was undisbursed.

3.35 Annex 4 shows the actual and forecast disbursements for Loan 1144-SYR. Disbursement performance under Mehardeh II was disappointing; by the agreed closing date, almost 30% of the loan (US\$22 million) remained undisbursed. The main reasons for the delay in disbursements appear to have been the following: (i) the construction of the office building had not even started (up to US\$3.7 million); (ii) a contract for the construction of four substations was several years overdue (up to US\$10 million); (iii) some savings were already apparent (up to US\$2.5 million); and (iv) general delays in the project, and requests for disbursements greatly lagging behind actual payments.

Environmental Impact

3.36 The Mehardeh Station is located in the hilly and less cultivated region beyond the gorge of the Orontes River. A 125-m high chimney was included in the Project to assure diffusion of obnoxious fumes and particulates. Forced draft cooling water towers with a low profile were also provided to ensure minimum amount of cooling water and to avoid the heating of the Orontes waters. It was therefore expected that the environmental impact of the station would be minimal. This was in fact the case when the project was completed. Nevertheless, sufficient space has been provided at the site to install exhaust gas cleaning facilities if found necessary in the future.

Performance of Consultants and Contractors

Consultants

3.37 All consultants encountered financial difficulties. Payments were made late (sometimes extremely late) and representations were made to the Bank by consultants. Because contracts were narrowly defined, many controversies arose about work to be executed. In fact, because no agreement could be reached between PEE and the original engineering consultants on the extension of their contract to also cover the last 4 substations (Mehardeh), PEE decided to engage new consultants for these stations which were constructed by a different supplier.

3.38 The engineering consultants--who prepared all development studies, made preliminary design and supervised the execution of the (mainly turn-key) contracts for the Mehardeh power station and substation (except the last 4 pertaining to Mehardah II)--performed well and, in apparent good cooperation with contractors, solved most technical problems. They were never able to solve adequately the administration of the projects probably due to PEE's difficulty in providing timely and concise information on cost incurred by PEE itself. Reporting did not measure up to the requirements of the Bank inasmuch as it was confined largely to the narrow limits of the contracts. This would not have caused difficulties if PEE had used the information to prepare quarterly reports within the general scope of its own operations; however, no such reports have ever been prepared.

3.39 With the appointment of new consultants for project supervision and administration, effective project administration terminated (except for the 4 substations). As a consequence, final project costs are somewhat uncertain. The new consultants subsequently operated within the even more restricted limits of the 4 substations.

3.40 The team made available by the expatriate firm of consultants to train Mehardeh power station personnel performed well.

3.41 To review the performance of the management consultants is rather difficult. The initial consultants prepared reports which were never implemented and only when replaced by new consultants did it become apparent that PEE did not agree with many of their proposals. However, the new consultants who, in effect, had to prepare a new set of reports, did not fare better: at the time of the PCR mission, no action had been taken to implement their proposals (para 5.02).

3.42 The tariff study was satisfactorily executed by the consultants; but the study required a considerable follow-up effort by PEE for implementation. However, no action was taken to implement the recommendations of the study.

Contractors

3.43 The performance of the contractor for the power station was affected somewhat by the fact that the new site had not been surveyed completely. Karst holes were discovered under the main foundations and chimneys.

Difficulties also arose with inadequate performance of the civil works contractor and procurement of local equipment. The contractor apparently also had difficulties in installing his own equipment.

3.44 The contractor of the majority of the substations (all, except the last 4 under Mehardeh II) also had considerable difficulties with its local civil works sub-contractor. Additionally, details of the electrical works (particularly control equipment) were not executed to PEE's satisfaction, but it took the contractor a long time (spread over a period of 1-2 years) to remedy the situation before the stations could be finally taken over. The contractor contracting the last 4 substations had even more civil work difficulties and general performance appears little better than that of the above contractor. For these reasons, at the time of the PCR missions, the substations had still not been taken over finally (one substation has not yet been constructed).

IV. OPERATING PERFORMANCE

Operations

4.01. The operating performance of the Mehardeh station has been good, as seen from the data in Annex 5. Some concern has been expressed in the Bank as to whether PEE has been over-investing in thermal plant, including Mehardeh. This is now proved to be unfounded. By the time Mehardeh became operational in 1979, the Thawra station was producing its forecast average energy (2,300 GWh/a) and, apparently has been generating at near full energy capability ever since, with a continuously rising output until in 1982 it generated 2,922 GWh. Its share in generation during the period, however, declined from 71% to 54% while Mehardeh's rose from 13% in 1979 to 24% in 1982 and "other" thermal plants from 16% to 22%.

4.02. Mehardeh operated at an efficiency of 2,590 kcal/kWh (or 10275 Btu/kWh) as compared with 2,375 kcal/kWh guaranteed for a certain fixed operating regime. The total lifetime of both units has been 17,520 hours until the end of 1982 and their combined operation 12,957 hours, i.e., the units operated 74% of the time. Station availability rose from 80% in 1980, the first year of full operation, to 97% in 1982 and averaged 88% since the units became operational.

4.03 The number of personnel (267 in 1982) is about one per MW, which is satisfactory given the power station's remote location. A matter of concern is the procurement of spare parts, which is subject to tortuous bureaucratic procedures. The cost to the economy of these delays must be enormous (gas turbines which would operate in the event of a breakdown of Mehardeh do so at a minimum of double the price of fuel, i.e. some LS 0.4/kWh compared with LS 0.2 for Mehardeh).

Growth of Energy and Capacity Demand

4.04 Although normally a comprehensive set of operational data relating to Meinardeu should be available, the actual statistical information available with PEE is still scant and unreliable. The available statistical information for 1970-82 on sales, losses, generation, number of consumers and employees is shown in Annex 6. The appraisal estimates for sales, generation and maximum demand have proven to be overoptimistic as by and large, they exceed actuals by a wide margin (Annex 7). The differential is explained by the uncertainty about political and economic developments that prevailed at appraisal in the wake of the 1973 Middle East war. Although the projections were derived from an elaborate study of the relations between electricity consumption and economic growth, they were based on unrealistic assumptions. By 1979, domestic and commercial sales were underestimated by a factor of 2 to 2.5, sales to industry were overestimated by a factor of 2 and irrigation by a factor of 6. Some salient features of the growth of load, generation and consumers during this period are as follows:

- (i) Growth can be roughly split into two periods of six years each; during the second period (1976-82) growth accelerated considerably, and during the last few years, has been of the order of 20% p.a.. On July 1, 1980, an average rate increase of about 50% became effective, which may have had a temporary effect on sales and generation, because sales grew only 6.8% in 1980.
- (ii) Losses, which were a satisfactory 15% during 1974-76, rose to some 20% in subsequent years - a not unexpected level in a rapidly expanding system where distribution investments have not kept pace with investments in generation and transmission - and jumped in 3 years to 32.8%. Large non-technical losses (including possible thefts) would form part of these high losses, reflecting PEE's organizational and administrative deficiencies.
- (iii) A clear indication that even the new thermal plant at Baniyas does not constitute overinvestment in generation is the fact that generation from inefficient plant - Ain at Tell Aleppo), Hameh (Damascus) and gas turbines - has been rising exponentially in the last three years.
- (iv) While during 1976-82, the number of consumers grew by above 12% p.a., the number of personnel rose by about 8% p.a.; consequently the number of consumers per employee rose from a relatively low 65 in 1976 to a reasonable 82 in 1982.

V. FINANCIAL PERFORMANCE

Reorganization of Accounts

5.01 In 1973, PEE's accounting system required major reorganization, partly because of its reliance on the Ministry of Finance for all non-routine

financial operations but also because the accounting organization was fragmented and records were kept in a number of centers (Damascus, Homs, Aleppo, Latakia, etc.) where the levels of accounting skills varied widely and whose procedures and accounting principles were not always consistent. Returns were being sent only annually to the head office in Damascus and the consolidated accounts were therefore produced late. Clearly, the overall general accounting and preparation of consolidation accounts were unsatisfactory.

5.02 Consultants were appointed under a contract dated March 31, 1975 under Mehardeh 1 to study the accounting problems and to recommend a suitable utility type accounting system. A system expected to satisfy the requirements of the Ministry of Finance was proposed by the consultants, and PEE and the Bank also agreed on the proposed accounting system. However, no action was taken by PEE to implement the recommended system. A second firm of consultants was appointed in 1980 to assist in the reorganization of PEE, to recommend new accounting systems based on those recommended by the first firm and to help train administrative and accounting staff. The firm submitted its recommendations around March 1983, and again, since the contract did not cover implementation of the recommended systems and procedures, PEE is now faced with the task of carrying out the implementation. Since PEE would not be able to complete the implementation phase by itself, it is now considering the appointment of the same consultants under a new contract to help implement the recommended systems and procedures.

Revenue Covenant

5.03 PEE's minimum tariffs are regulated by a law requiring tariffs to cover in addition to operational cost, a reserve for construction of 3% of gross revenues, and a return of 4% on invested capital. These requirements, however, can be diluted or waived by the Cabinet. In order to ensure adequate cash generation by PEE for financing its expansion requirements the agreement under Loan 986-SYR required PEE to maintain, until December 31, 1977, its overall average electricity tariffs at a level at least as high as that of May 31, 1973, and to earn from January 1, 1978 a return of not less than 9% on average net fixed assets in operation. Since this provided a satisfactory basis for assuring PEE's financial performance, the covenant was repeated in the agreement for Loan 1144-SYR. In order that inflation may not result in depressing the level of self-financing, it was also provided that the return be computed on revalued assets. The management consultants (para 5.02) were required to formulate a standing procedure which would provide for a revaluation of PEE's assets in 1975 and thereafter on an annual basis as may be necessary. The covenant was also extended to the third power loan of 1978 with the proviso that certain Government subsidies could be taken into account for computing the return through 1980.

Performance Under the Covenant

5.04 At the time of appraisal of Loan 986-SYR, it was estimated that compliance with the revenue covenant would secure for PEE a cash generation of 20% of the cost of its investment program during 1973-1979. Under Loan 1144-SYR, the expected cash generation was 28% during 1974-80 and it was also

estimated that to earn a 9% return in 1978, PEE would need an average tariff increase of 33% as of January 1, 1978. Unfortunately, these expectations of tariff increase, rate of return and cash generation have not materialized. The actual rates of return compared to the appraisal estimates during 1974-1980 are given in PEE's Income Statements in Annex 8. A summary is given below:

	<u>PEE's Rate of Return - %</u> <u>(Actual vs. Estimates)</u>									
	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	
Loan 980-SYR										
Appraisal Est.	Nega- tive	5.0	6.2	7.4	9.4	9.4	-----No Estimate-----			
Agreed Target	None	None	None	None	9.0	9.0	9.0	9.0	9.0	
Loan 1144-SYR										
Appraisal Est.	2.5	4.7	5.2	5.1	9.0	10.3	11.6	-No Estimate-		
Agreed Target	None	None	None	None	9.0	9.0	9.0	9.0	9.0	
Actual Return	Nega- tive	Nega- tive	Nega- tive	0.5	Nega- tive	Nega- tive	6.3	Nega- tive	Nega- tive	

Note: The above returns are computed on unrevalued assets. On revalued assets, the actual return would have been negative in 1977 and 1980 also.

PEE's performance was far below appraisal expectations through 1977 (no specific rate of return targets were fixed for this period). For the period from 1978 also, PEE has consistently fallen far short of meeting the required 9% return on revalued assets. During 1980, helped by the 50% tariff increase from July 1, it earned a 6.3% return on unrevalued assets; the return would have been negative on revalued assets. During 1981 and 1982, PEE did not achieve a positive rate of return even on unrevalued assets because the operating revenues were less than the operating expenses. (In 1982, operating revenues were only about 70% of operating expenses.) It would also be seen that PEE failed to generate any funds internally for financing expansion during 1974-80, as against 28% estimated at appraisal. In fact, it has had to borrow more and more to service its debt. Perhaps this is a reflection of the Government's view that in a centrally planned economy like Syria's, public

sector enterprises such as PEE should operate in the context of the overall national economic and pricing policies of the Government and not necessarily as commercially viable enterprises.

Further Review of the Revenue Covenant

5.05 In late 1980, the Syrian authorities had proposed that the Bank review with them the possibility of introducing an alternative covenant for measuring financial performance that is more attuned to the Government's philosophy, its social objectives and its income distribution policy. The Bank agreed in April 1982 that it could conduct such a review but that as a minimum there should be:

- (a) proper recapitalization of PEE (whose accumulated losses now exceed its capital) by conversion of PEE's long-term debt to the Government into permanent capital;
- (b) tariff action to generate sufficient revenues to achieve short-term cost recovery (recovery of operating expenses plus fixed assets depreciation or debt service, whichever is greater); and
- (c) Government's agreement in principle with the Bank for annual tariff revisions that would eventually achieve the long-term objective of efficiency pricing.

Despite the matter being followed up by the Bank, the Government's position on this is still not known. It is estimated that with the existing tariffs and operating costs, the operating revenues in 1983 would amount only to 76% of the total operating expenses; in 1984 the percentage would be even less, namely, 66%. This is an entirely unacceptable state of affairs. The minimum tariff action that should be considered as acceptable, that too only as a first step, should be for PEE to generate enough cash flow to cover all cash operating expenses and debt service. Clearly, Government needs to approve significant tariff increases immediately (at least an average 80% increase is now estimated as necessary for achieving this) to enable PEE to achieve, as a first step, the above minimum objective.

Tariffs

5.06 At appraisal, PEE's tariffs generally comprised flat kWh rates for domestic and general lighting connections, declining block rates for smaller industrial and commercial consumers, and time-of-day kWh rates for the larger industrial connections. With the objective of unifying and modernizing the tariffs structure, PEE engaged under Loan 986-SYR, an expatriate firm of consultants in 1975 to develop new tariffs based on marginal-cost pricing. A final report was received and recommendations and actions to be taken for implementing them were discussed between PEE and the Bank even before the next power loan was sanctioned in early 1978. Although under Loan 1144-SYR, PEE had confirmed that on the basis of the recommendations of the tariff study it

would promptly take all necessary and appropriate actions to institute a new tariff structure together with a sequential increase in tariffs to meet by 1978 the rate of return target of not less than 9% as agreed under Loan 986-SYR, no action has been taken to implement the recommendations of the study.

PEE's Accounts and Audit Reports

5.07 PEE's accounting work is badly in arrears. Under the existing loan covenants, its accounts for a year are required to be sent to the Bank within four months of the close of the year. Yet, the accounts and audit reports for 1978, 1979, 1980, 1981 and 1982 have not been sent to the Bank so far. The status of these accounts is as follows:

- 1978 & 1979 - accounts audited and audit reports prepared in Arabic being translated into English;
- 1980 - accounts prepared by PEE are under audit. Audit is expected to be completed by end-June 1983;
- 1981 - PEE expects to complete the accounts by end-June 1983. Audit will take another six months;
- 1982 - The accounts which were due by end-April 1983 will have to be completed after the 1981 accounts are completed.

PEE is aware that accounts prepared so late became worthless as a management tool. The above-mentioned serious delay in accounting work and in the submission of the audited accounts to the Bank is within the knowledge of the Minister and the Director General of PEE. PEE has promised to make all-out efforts to overtake the arrears in accounting work as quickly as possible and to send the audited accounts to the Bank without delay.^{1/}

5.08 A question also arises regarding the acceptability of the auditing arrangements, i.e., the audit conducted by the Central Agency for the Control of Public Finances. The Bank would have to await the receipt of the Audit Reports before commenting on this aspect.

Debt Service Coverage

5.09 Under the subject loans, PEE agreed to obtain the Bank's prior consent to any borrowing it plans to undertake whenever its internal cash generation is not sufficient to cover its debt service at least 1.5 times in any future year. Throughout the period 1974-1979, the debt service coverage ranged from 0.26 to 0.65, and in 1980 it was a little over 1.0. Thereafter, the position deteriorated and in 1981, 1982 and 1983, PEE has had a negative cash flow. Nevertheless, PEE kept on making long-term borrowings throughout the period without obtaining the Bank's prior approval. Therefore, the purpose of PEE and the Bank keeping under review PEE's assumption of debt liabilities, as was the intention behind the debt service covenant, was frustrated.

^{1/} The Borrower observed that (everything considered) PEE had made a great effort to finish the accounts, and noted that the 1983 accounts and audit reports should be available by end-1984.

5.10 The consequence of the debt service coverage being less than one during 1974-1982 except 1980 has been that PEE has had to keep on borrowing more and more merely to meet its debt service obligations from year to year. This unhealthy condition has arisen because of the low level of PEE's revenues as a result of low tariffs and a large investment program necessitating ever-increasing borrowings. This situation needs immediate corrective action.

VI. INSTITUTIONAL PERFORMANCE

6.01 PEE's performance has been deficient in practically all respects, except in the purely technical area. Power generation, transmission and distribution facilities have been constructed, though with considerable delay, and the energy flows to the consumers, but this is neither at high efficiency, nor at high reliability and is not supported by a strong organization that manages its affairs, maintains its financial position, plans its future expansion and carries on its operations, in accordance with sound business, financial and public utility practices and under the supervision of experienced and competent management, assisted by qualified and competent staff. Although considerable delays occurred and the training of administrative staff never developed, the training program for technical staff was conducted reasonably satisfactorily. Staff at the Mehardeh power station was adequately trained and the station is operating satisfactorily.^{1/}

6.02 PEE's main problems are:

- (i) poor organization and bureaucratic procedures;
- (ii) inadequate accounting system;
- (iii) poor communications arising partly from widely dispersed offices;
- (iv) lack of delegation of responsibilities;
- (v) lack of autonomy: PEE forms a part of the Ministry of Electricity and suffers from ad hoc Governmental decisions which detract from sound planning that would result in a well defined and regularly updated least cost development program;
- (vi) inadequate remuneration of experienced staff causing a steady exodus of such staff to the Gulf area seeking the better opportunities available there, a situation exacerbated by the long period of compulsory military service; and
- (vii) poor finances: during the period of the projects, rates were increased only once (by an inadequate 50 percent; this was largely offset by a subsequent increase in fuel prices).

^{1/} The Borrower commented that the (main) reasons for these weaknesses is shortage of qualified staff, qualified people seeking better work opportunities at home or abroad.

6.03 Management, organizational, administrative and accounting recommendations made by consultants have yet to be implemented. A tariff study, completed under the first project, with the objective of modernizing PEE's tariff structure, was never implemented. The need for a new head office to be financed by the second project, was apparently not perceived as urgent by the Government and, when, after a delay of some four years bids were finally invited, the size had doubled and the cost had more than quadrupled. Because of misprocurement, the Bank finally cancelled the relevant US\$3.7 million from the loan.

VII. PROJECT JUSTIFICATION

7.01 The main objectives of the Project were: (i) to provide PEE with additional generating and substation capacity as part of its least cost development program; and (ii) to improve the entity institutionally. While the first objective has basically been reached, the Projects almost totally failed to achieve the second (para 6.03). Technically, the power needs are largely being met, though not at the level of reliability that was first envisaged; this is due to the delays in completing the substations and the dispatch center. In addition, power is generated at a high cost to the economy, because of sub-par levels of efficiency, whether technically, organizationally or administratively and losses are at a very high level. Thus, important resources are being diverted from other sectors in urgent need of those resources.

Economic Rate of Return

7.02 At appraisal, the internal economic rate of return for each project (Mehardeh I and Mehardeh II), defined as the discount rate which equalizes the present values of time-streams of the costs and benefits attributable to the project over its life (assumed to be 25 years), was estimated to be at least 15% and 12% respectively. The costs included the project's capital costs, a proportion (20%) of the development of the 230-kV and 66-kV transmission system and a share in the cost of distribution expansion plus the operating costs of the additional facilities. The associated benefits included revenues accruing to PEE from sales of electricity (at projected tariffs) through additional generation from the Mehardeh units.

7.03 It was found impossible to calculate an ex-post rate of return for each individual project because operating costs cannot be separated. An attempt was made at calculating a single rate of return on both projects combined, based on data adjusted to reflect actual changes in costs and benefits attributable to them. However, no calculation of the rate of return was possible since it produced negative benefit streams in every year of the projects' life (Annex 9). This is essentially due to the fact that electricity tariffs, instead of remaining constant in real terms over the life of the projects as was assumed at time of appraisal, have suffered a real decrease in every year since 1978 except 1980. A sensitivity analysis was

performed to determine the level of tariffs that would be required to earn a given rate of return. According to this analysis, tariffs would need to be increased by a factor of 2.5 and remain constant in real terms until the end of the period 1984-2004 to reach a zero rate of return. However, benefits calculated on the basis of existing tariffs are substantially underestimated as they do not include non-quantifiable and indirect benefits which accrue to the consumers of electricity.

VIII. BANK'S PERFORMANCE

8.01 Considerable Bank staff time has been spent on the projects but the results have not been commensurate with the Bank's efforts. In the technical area, the Bank was able to play a constructive role but in all other areas, it did not succeed in having much impact. It certainly identified the right issues at appraisal and provided appropriate covenants to ensure action, but it was not able to do more than this. Although supervision continued throughout the period, an increasing attitude of resignation seems to have developed on the part of Bank staff, perhaps out of a perceived sense of futility of the whole effort of moving PEE towards reasonable institutional goals. A contributory factor was a cooling of the dialogue between the country and the Bank that seems to have developed in the past three or four years regarding the overall strategy for the country's development. As a result of this, the Bank decided to reduce its overall supervision effort in the country resulting in the supervision of the subject projects also becoming rather desultory towards the closing stages of the project period. Because of staff constraints there was also during the period a lack of continuity of Bank staff for supervision work.

IX. CONCLUSIONS

9.01 To the extent that these loans helped PEE to establish efficient power generation and transmission facilities at a critical time to meet the ever-increasing demand, they should be deemed to have been a success. However, in most other respects these operations have been a signal failure. PEE continues to be plagued by a serious lack of competent and experienced staff. Its organization and procedures are badly in need of streamlining. Its tariffs are not based on the cost of supply. Its finances have deteriorated steadily over time, until today its operating revenues cover only about 70% of its operating expenses. Its audited accounts for five years beginning with 1978 have yet to be submitted to the Bank. Those for the past three years (1980, 1981 and 1982) have not even been prepared and so in a way, PEE is operating practically in the dark in the financial area. This state of affairs essentially has its roots in a lack of commitment to make PEE a viable and efficient utility, which in turn has led to lack of essential action on

various fronts. Action to implement the recommendations of various studies initiated under these loans would have led to significant improvement in the operations of PEE and in its health.

Lessons to be Learned

9.02 These loans typify what could go wrong with even a well conceived lending operation. The most important lesson to be learned from the lack of success in achieving the institutional goals of these lending operations is the imperative need for the Bank on the one hand, and the borrower and the country on the other, to have an identity of project goals. In the absence of such an identity of goals and a firm commitment to secure these goals, no lending operation will have any chance of meeting its objectives.

SYRIA

MEHARDEH I AND MEHARDEH II PROJECTS - LOANS 986-SYR AND 1144-SYR

PEE

Status of Compliance with Major Loan Covenants

Sections
of Loan/
Guarantee
Agreements

Substance of Covenant

Extent of Compliance

LA 986-SYR - 3.02 LA 1144-SYR - 3.02	PEE to continue to employ consultants acceptable to the Bank for engineering, supervision of construction and administration of the projects under terms of reference and conditions acceptable to the Bank.	Complied with.
LA 1144-SYR - 3.03	PEE to engage consultants, under terms of reference and conditions acceptable to the Bank, for the execution of a study for industrial energy and power requirements in PEE's system and plant connected or to be connected to it, and subsequently discuss with the Bank the actions it proposes to take.	Study completed, though late. Discussions with the Bank were perfunctory.
LA 986-SYR - 3.04	PEE to engage consultants acceptable to the Bank by not later than September 30, 1974 to review its organization, accounts and procedures and to discuss with the Bank the actions it proposes to take as a result of the study.	Consultants, appointed in March 1975, completed the study but no action was taken to implement the recommendations.
GA 1144-SYR - 3.02	Government to cause PEE to adopt in consultation with the Bank a new uniform accounting system suitable for utilities.	
LA 986-SYR - 3.04	PEE to engage consultants acceptable to the Bank by not later than September 30, 1974 to study and advise on its tariffs structure and to discuss with the Bank the actions it proposes to take as a result of the study.	Tariff study completed and the action to be taken on the recommendations was discussed between PEE and the Bank.

SYRIA

MEHARDEH I AND MEHARDEH II PROJECTS - LOANS 986-SYR AND 1144-SYR

PEE

Status of Compliance with Major Loan Covenants

<u>Sections of Loan/ Guarantee Agreements</u>	<u>Substance of Covenant</u>	<u>Extent of Compliance</u>
LA 1144-SYR (see below)	PEE to engage consultants for execution of the following studies (and review with the Bank any action it proposes to take as a result of such studies) in accordance with the time schedules indicated:	
LA 1144-SYR - 3.04	(i) A feasibility study for the availability and use of gas in the eastern part of the country for power generation and other purposes. Consultants will be employed not later than September 30, 1975 for completing the study before September 30, 1976.	Complied with, though late.
LA 1144-SYR - 3.03	(ii) A rural electrification development and feasibility study for completion prior to June 30, 1976.	Complied with . The study formed the basis for a subsequent Regional Electrification Proj.
LA 1144-SYR - 3.04	(iii) A feasibility study for interconnection of PEE's system with its neighboring countries. Consultants for this study will be appointed not later than December 31, 1975 for completing the study prior to December 31, 1976.	Complied with, though late.
LA 986-SYR - 3.05	PEE to sign a contract not later than July 1, 1975 for the construction of 230-kV lines interconnecting Mehardeh with the system by not later January 1, 1977.	Complied with.

SYRIA

MEHARDEH I AND MEHARDEH II PROJECTS - LOANS 986-SYR AND 1144-SYR

PEE

Status of Compliance with Major Loan Covenants

Sections
of Loan/
Guarantee
Agreements

Substance of Covenant

Extent of Compliance

LA 986-SYR -
5.02
LA 1144-SYR -
5.02

PEE to have its annual accounts audited and certified by independent auditors acceptable to the Bank and to submit the audited accounts and audit report to the Bank within four months after the end of each year.

- (a) The accounts and audit reports for 1978, 1979, 1980, 1981 and 1982 have not been sent to the Bank so far. The status of these accounts is as follows:
1978 - accounts audited and & audit reports prepared in Arabic being translated into English;
1979 - accounts prepared by PEE are under audit. Audit is expected to be completed by end-June 1983;
1980 - PEE expects to complete the accounts by end-June 1983. Audit will take another six months.
1981 - The accounts which were due by end-April 1983 will have to be completed after the 1981 accounts are completed.

- (b) Quality of audit reports may present a problem, because they will be issued by Central Agency for the Control of Public Finances whose auditors have not been trained in international auditing procedures.

LA 986-SYR -
5.04
LA 1144-SYR -
5.04

PEE to maintain its overall average electricity tariffs at least at its May 1973 levels through the year 1977.

Complied with.

SYRIA

MEHARDEH I AND MEHARDEH II PROJECTS - LOANS 986-SYR AND 1144-SYR

PEE

Status of Compliance with Major Loan Covenants

<u>Sections of Loan/Guarantee Agreements</u>	<u>Substance of Covenant</u>	<u>Extent of Compliance</u>
GA 986-SYR - 3.02	Government to transfer to PEE ownership of the electricity generating and transmission assets of Euphrates Dam (Thawra assets).	Not complied with. In fact, Government considers transfer of these assets to PEE inopportune at present.
LA 986-SYR - 5.05	PEE to maintain, in 1978 and thereafter, electricity tariffs at levels high enough to provide a rate of return of 9% on average net fixed assets in operation, as revalued, including a realistic value for the Thawra generating assets transferred to it.	Not complied with. PEE's return has been consistently far short of the required 9% on revalued assets (para 5.04). The only tariff increase since 1974 was an average 50% increase on July 1, 1980. During 1981 and 1982 PEE did not even achieve a positive return.
LA 1144-SYR - Suppl. Letter	PEE to promptly take all necessary and appropriate actions based on the tariff study to institute a new tariff structure together with sequential increase in tariffs to meet by 1978 the rate of return target of not less than 9%.	As above.
LA 986-SYR - 5.06 LA 1144-SYR - 5.06	PEE to obtain the Bank's prior approval of any new borrowing unless its cash flow in a 12-month period is at least 1.5 times its maximum debt service for any succeeding fiscal year on all debts including the debt to be incurred.	Not complied with. PEE has been consistently borrowing without approval of the Bank (para 5.09).

SYRIA

**MEHARDEH I THERMAL POWER PROJECT
(LOAN 986-SYR)**

PEE

**Project Cost Comparison
Appraisal and Revised Estimate vs. Actual**

	<u>Original Estimate (2/28/74)</u>			<u>Revised Estimate (5/23/74)</u>			<u>Actual Cost (12/1982)</u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
	----- US\$1,000 -----			----- US\$1,000 -----			----- US\$1,000 -----		
A. <u>Power Station Mehardeh</u>									
Civil works	4,900	1,890	6,790						
Boiler plant	4,090	15,540	19,630						
Electrical plant	1,130	4,310	5,444						
Subtotal	10,120	21,740	31,860	8,580	54,020	62,600	30,602 /1	55,803	86,405
							(21,974)/2	(55,803)	(77,777)
B. <u>Substations</u>									
Aleppo	310	1,130	1,440	150	1,805	1,955	179	1,417	1,596
Hama	1,000	2,140	3,170	510	3,415	3,925	608	3,084	3,692
Homs (Katineh)	110	350	460	55	560	615	118	799	919
Tartous	800	1,360	2,160	390	2,170	2,560	603	2,317	2,920
Damascus (Kaboun 2, Midan 2)	520	1,600	2,120	260	2,555	2,815	702	4,278	4,980
Raqqa	780	1,560	2,340	385	2,490	2,875	644	2,150	2,794
Meskene	620	1,060	1,680	310	1,695	2,005	609	1,579	2,188
Subtotal	4,170	9,200	13,370	2,060	14,690	16,750	3,463	15,624	19,087
							(2,782)/2	(15,624)	(18,406)
C. <u>Engineering, Supervision</u>	1,170	1,630	2,800	330	2,930	3,260	353	2,852	3,205
D. <u>Consulting Services</u>									
Management	160	590	750	50	150	200	-	470	470
Experts for Mehardeh operations	100	295	395	150	350	500	-	-	-
Tariffs	-	-	-	20	120	140	3	23	26
Training	260	245	505	260	250	510	-	-	-
Subtotal	520	1,130	1,650	480	870	1,350	3	493	496
(Total C + D)	(1,690)	(2,760)	(3,450)	(810)	(3,800)	(4,610)	(293)/2	(3,345)	(3,638)
E. <u>Contingencies</u>									
Physical	2,140	2,170	4,310	890	6,380	7,270	-	-	-
Price	1,440	7,130	8,570	3,090	6,550	9,640	-	-	-
Subtotal	3,580	9,300	12,880	3,980	12,930	16,910	-	-	-
Total Project Cost	<u>19,560</u>	<u>43,000</u>	<u>62,560</u>	<u>15,430</u>	<u>85,440</u>	<u>100,870</u>	<u>34,421</u>	<u>74,772</u>	<u>109,193</u>
							(25,049)/2	(74,772)	(99,821)

/1 This amount may not include a proportionate portion (US\$3.9 million) of the total cost (US\$5.2 million) of the railway spur Hama-Mehardeh financed by PEE, probably in 1976/77.

/2 In prices of 1974.

(1357P)

SYRIA

MEHARDEH II THERMAL POWER PROJECT
(LOAN 1144-SYR)

Project Cost Comparison
Appraisal Estimate vs. Actual

	----- Appraisal Estimate -----			----- Actual Cost -----		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Local</u>	<u>Foreign</u>	<u>Total</u>
	----- US\$1,000 -----			----- US\$1,000 -----		
A. <u>Power Station Mehardeh</u>	6,060	39,130	45,190	17,300/1 (11,908)/2	41,450 (41,450)	58,750 (53,358)
B. <u>Substations</u>						
Dair ez Zor	253	1,104	1,357	373	1,215	1,588
Souedie	368	1,917	2,285	379	1,983	2,362
Hassaken	385	1,972	2,357	946	2,152	3,098
Kaboun 1 (Damascus)	67	716	783	131	844	975
Lattakia	385	1,971	2,356	818	2,663	3,481
Maskene 0 (Extension Maskene 1)	355	1,647	2,002	184	1,580	1,764
Maskene 2	207	1,488	1,695	482	1,162	1,644
Adraa (2)	420	2,525	2,945	2,037	7,073	9,110
Subtotal	2,440	13,340	15,780	5,350 (3,119)/2	18,672 (18,672)	24,022 (21,791)
C. <u>Head Office Building</u>	2,950	3,070	6,020	-	-	-
D. <u>Engineering, Supervision, Management</u>	490	3,470	3,960	1,234	5,803	7,037
E. <u>Other Consulting Services</u>						
Energy study	50	200	250	153	722	875
Souedie gas study	80	300	380	93	709	802
Interconnection study	140	500	640	9	39	48
Rural electrification study	100	400	500	51	348	399
Training	890	740	1,630	3,407	1,687	5,094
Subtotal	1,260	2,140	3,400	3,713	3,505	7,218
(Total D + E)	(1,750)	(5,610)	(7,360)	(2,686)/2	(9,308)	(11,994)
F. <u>Contingencies</u>						
Physical	1,040	5,210	6,250	-	-	-
Price	3,110	5,640	8,750	-	-	-
Subtotal	4,150	72,000	89,350	27,597 (17,713)/2	69,430 (69,430)	97,027 (87,143)

/1 The amount may not include a proportionate portion (US\$1.3 million) of the total cost (US\$5.2 million) of the railway spur Hama-Mehardeh financed by PEE, probably in 1976/77.

/2 In prices of 1974.

(1357P)

SYRIAPROJECT COMPLETION REPORT Loan 986-SYRMehardeh I Thermal Power ProjectCumulative Disbursements - Actual vs. Estimated
(US\$ million)

<u>Bank Fiscal Year and Quarter</u>	<u>Appraisal Estimate</u>	<u>Actual Disbursements</u>	<u>Actual as % of Appraisal Estimate</u>
<u>1974/75</u>			
December 31, 1974	3.1	-	0
March 31, 1975	3.9	-	0
June 30, 1975	4.7	-	0
<u>1975/76</u>			
September 30, 1975	6.3	2.2	34.9
December 31, 1975	9.4	3.7	39.4
March 31, 1976	10.9	5.6	51.4
June 30, 1976	13.3	8.7	65.4
<u>1976/77</u>			
September 30, 1976	15.6	11.8	75.6
December 31, 1976	17.2	14.3	83.1
March 31, 1977	19.5	19.0	97.4
June 30, 1977	22.9	21.6	94.3
<u>1977/78</u>			
September 30, 1977	26.6	24.8	93.2
December 31, 1977	28.1	26.3	93.6
March 31, 1978	29.7	26.5	89.2
June 30, 1978	30.5	29.0	95.1
<u>1978/79</u>			
September 30, 1978	31.2	29.9	95.9
December 31, 1978	32.0	30.7	101.3
March 31, 1979	32.0	32.4	97.9
June 30, 1979 (original closing date)	33.6	32.9	98.5

SYRIA

PROJECT COMPLETION REPORT Loan 986-SYR

Mehardeh I Thermal Power Project

Cumulative Disbursements - Actual vs. Estimated
(US\$ million)

<u>Bank Fiscal Year and Quarter</u>	<u>Appraisal Estimate</u>	<u>Actual Disbursements</u>	<u>Actual as % of Appraisal Estimate</u>
<u>1979/80</u>			
September 30, 1979		33.1	98.5
December 31, 1979		33.1	98.5
March 31, 1980		33.2	98.8
June 30, 1980		33.2	98.8
<u>1980/81</u>			
September 30, 1980 (1st ext. cl. date)		33.3	99.1
December 31, 1980		33.3	99.1
March 31, 1981		33.3	99.1
June 30, 1981		33.3	99.1
<u>1981/82</u>			
September 30, 1981		33.4	99.4
December 31, 1981 (2nd ext. cl. date)		33.4	99.4
March 31, 1982		33.5	99.7
April 30, 1982 (final closing date)		33.5 <u>1/</u>	99.7

1/ An undisbursed balance of US\$117,837.64 was cancelled.

June 1983
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SYRIAPROJECT COMPLETION REPORT Loan 1144-SYRMehardeh II Thermal Power ProjectCumulative Disbursements - Actual vs. Estimated
(US\$ million)

<u>Bank Fiscal Year and Quarter</u>	<u>Appraisal Estimate</u>	<u>Actual Disbursements</u>	<u>Actual as % of Appraisal Estimate</u>
<u>1975/76</u>			
December 31, 1975	8.0	-	0
March 31, 1976	12.0	-	0
June 30, 1976	20.0	5.5	27.5
<u>1976/77</u>			
September 30, 1976	25.0	7.5	30.0
December 31, 1976	29.0	12.3	42.4
March 31, 1977	32.0	17.1	53.4
June 30, 1977	39.0	21.1	54.1
<u>1977/78</u>			
September 30, 1977	46.0	28.1	61.1
December 31, 1977	55.0	31.2	56.7
March 31, 1978	57.0	33.8	59.3
June 30, 1978	60.0	37.3	62.2
<u>1978/79</u>			
September 30, 1978	65.0	38.4	59.1
December 31, 1978	69.0	41.2	59.7
March 31, 1979	69.0	42.3	61.3
June 30, 1979 (original closing date)	70.0	45.6	65.1
<u>1979/80</u>			
September 30, 1979	71.0	47.5	66.9
December 31, 1979	72.0	49.6	68.9
March 31, 1980		50.4	70.0
June 30, 1980		56.2	78.1

SYRIAPROJECT COMPLETION REPORT Loan 1144-SYRMehardeh II Thermal Power ProjectCumulative Disbursements - Actual vs. Estimated
(US\$ million)

<u>Bank Fiscal Year and Quarter</u>	<u>Appraisal Estimate</u>	<u>Actual Disbursements</u>	<u>Actual as % of Appraisal Estimate</u>
<u>1980/81</u>			
September 30, 1980 (1st ext. cl. date)		57.6	80.0
December 31, 1980		60.7	84.3
March 31, 1981		62.2	86.4
June 30, 1981		64.5	89.6
<u>1981/82</u>			
September 30, 1981		64.8	90.0
December 31, 1981 (2nd ext. cl. date)		64.8	90.0
March 31, 1982		65.4	90.8
June 30, 1982		65.5	91.0
<u>1982/83</u>			
September 30, 1982		65.5 ^{1/}	91.0
December 31, 1982		65.5	91.0
March 31, 1983		65.5	91.0
June 30, 1983		65.5	91.0
<u>1983/84</u>			
September 30, 1983		66.0	91.7
December 31, 1983 (3rd ext. cl. date)		67.5	93.8

1/ US\$3.7 million has been cancelled from the loan amount.

June 1983
(1357P)

SYRIA

MEHARDEH I AND II PROJECTS
(LOANS 986-SYR AND 1144-SYR)

Operating Statistics of Mehardeh Station

		<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>Total</u>	
Installed capacity	MW	.150	300	300	300	-	
Personnel	nr.	211	245	257	267	-	
Personnel	MW	1.41	0.82	0.86	0.89	-	
Gross production	GWh	404.5	623.1	1,113.7	1,302.5	3,443.8	
Station use	GWh(%)	31.2(7.7)	48.8(7.8)	72.2(6.5)	92.8(7.1)	245.0(7.1)	
Net production	GWh	373.3	574.3	1,041.5	1,209.7	3,198.8	
Fuel consumption	kt	81.5	173.2	285.0	319.0	858.7	
Efficiency (net)	t/GWh	218.3/1	301.6/1	273.6	263.7	268.4	<u>1/</u> Possible error in fuel 2 year average is 268.8 t/GWh at 9650 kcal/kg of residual fuel.
Efficiency (net)	kcal/kWh	2,107	2,910	2,640	2,545	2,590	
Cost: Personnel	kES	1,989.7	2,152.1	4,027.7	4,656.5		
Fuel	kES	24,448.8	51,962.0	225,178.4	252,797.6		
Other	kES	33,926.4	35,440.0	34,741.5	36,787.5		
Total	kES	60,364.9	89,554.1	263,947.6	294,241.6		
Cost: Personnel (net)	Piaster/kWh	0.53	0.37	0.39	0.38		
Fuel (net)	Piaster/kWh	6.55	9.05	21.62	20.90		
Other (net)	Piaster/kWh	9.09	6.17	3.34	3.04		
Total (net)	Piaster/kWh	16.17	15.59	25.35	24.32		
Fuel cost	£S/t	300	300	790	792		
A. Lifetime since first coupling, 2 units	h	7,056	17,568	17,520	17,520	59,664	
B. Hours of operation, 2 units In operation	h	4,006	7,450	10,984	12,957	35,397	
Average output (net)	% of time	57	42	63	74	59	Is B/A x 100
	MW	93	77	95	93	90	Is Net production - B
Maintenance outages:	nr	3	8	9	4	24	
cumulative	h	222	3,197	1,718	168	5,305	
Forced outages:	nr	8	18	44	53	123	
cumulative	h	340	316	506	536	1,698	
Available hours	h	6,494	14,055	15,292	16,816	52,661	
Availability	% of time	92	80	87	96	88	

(1357P)

SYRIA

MEHARDEH I AND II THERMAL POWER PROJECT
(Loan 986-SYR and 1144-SYR)

PEE

Sales, Generation and Maximum Demand 1970-1982

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>
<u>Sales (GWh)</u>													
Domestic and commercial	244.6	262.7	277.7	297.8	372.6	465.8	540.3	614.9	744.8	954.5	1,078.0	1,231.0	1,471.0
Official and lighting	46.6	52.1	55.8	50.6	54.0	74.0	110.2	134.9	176.4	230.4	236.0	282.0	333.0
Industrial	243.2	270.1	359.0	334.4	501.4	553.2	637.9	787.0	820.9	1,138.2	1,273.8	1,496.7	1,606.4
Irrigation	81.3/1	132.7/1	144.8/1	132.1/1	7.0	8.0	32.5	41.0	50.0	65.2	74.2	88.3	108.6
Exports	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	615.7	717.6	837.3	815.9	935.0	1,101.0	1,320.9	1,621.1	1,851.5	2,555.6	2,728.8	3,144.0	3,648.0
<u>Losses</u>													
GWh	161.3	188.4	224.7	212.2	155.0	208.0	305.2	431.3	643.8	706.4	978.8	1,271.2	1,782.7
% of Generation	20.8	20.8	21.2	20.6	14.2	15.9	14.9	21.0	25.8	21.7	26.4	28.8	32.8
Total Generation	777.0	906.0	1,062.0	1,028.1	1,090.0	1,309.0	1,626.1	2,052.4	2,495.2	3,262.0	3,707.6	4,415.2	5,428.7
Of which													
Hydro: Thawra							1,193.2	1,716.4	2,082.6	2,317.6	2,518.1	2,617.8	2,922.1
Other							36.7	51.6	51.4	34.3	42.7	30.3	36.5
Sub-total hydro							1,229.9	1,768.0	2,134.0	2,351.9	2,560.8	2,648.1	2,958.6
% of total							76	86	86	72	69	60	55
Steam: Baniyas							-	-	-	-	-	-	89.9
Mehardeh							-	-	-	434.6	684.6	1,113.7	1,301.6
Kattineh							110.6	98.2	154.5	114.7	149.8	288.3	520.0
Ain al Tell							75.4	38.5	44.5	40.5	25.4	60.2	79.3
Hameh							-	27.1	73.3	98.5	117.2	133.1	157.3
Sub-total steam							186.0	163.8	272.3	688.3	977.0	1,595.3	2,148.1
% of total							11	8	11	21	26	36	40
Gasturbines							111.5	48.6	50.3	185.9	142.7	153.0	305.9
% of total							7	2	2	6	4	3	5
Diesel							98.7	72.0	38.7	35.9	27.1	18.8	16.1
% of total							6	4	1	1	1	-	-
Number of consumers 1,000							659	774	824	927	983	1,178	1,325
Number of employees							10,145	11,066	11,866	12,939	13,920	14,978	16,135
Consumers per employee							65	70	69	72	76	79	82
Maximum demand in Inter-connected System MW	143	165	170	163	250	290	369	436	511	635	768	876	1,091

(Breakdown information not available in reports and files)

/1 Supply to Thawra construction.

Note: The above sales figures obtained from the Statistical Department do not tally with those appearing in the accounting books.

SYRIA
MEHADEN THERMAL POWER PROJECTS
(Loans 986-SYR and 1144-SYR)

FE

Growth of Sales and Maximum Demand - Actual vs. Estimates

Total Sales			--% Annual Growth--			Maximum Demand /2			% Annual Growth		Hydro Generation		Losses	
Actual	Estimate	% of Estimate	Actual	Estimate		Actual	Estimate	% of Estimate	Actual	Estimate	% of Total Actual	% of Total Estimate	Actual	Estimate
615.7	-	-	31.6	-		143	-	-	15.3	-				
717.6	-	-	16.6	-		165	-	-	15.4	-				
837.3	-	-	16.7	-		170	-	-	3.0	-				
815.9	-	-	-2.6	-		163	-	-	-4.1	-				
935.0	885 (890)/1	106 (106)/1	14.6	8.5 (9.1)/1		250	230 (215)/1	109 (116)/1	53.4	41.1 (31.9)/1	n.a.	31 (21)/1	n.a.	22.4 (1)
1,101.0	1,390 (1,120)	79 (98)	17.8	57.1 (25.8)		290	330 (283)	88 (102)	16.0	43.5 (32.6)	n.a.	37 (62)	n.a.	20.6 (2)
1,320.9	1,960 (1,680)	67 (79)	20.0	41.0 (50.0)		369	450 (435)	82 (85)	27.2	36.4 (52.6)	76	51 (550)	18.8	20.0 (20)
1,621.1	2,695 (2,110)	60 (77)	22.7	37.5 (25.6)		436	617 (353)	71 (79)	18.2	37.1 (27.6)	84	49 (70)	21.0	20.0 (19)
1,851.5	3,170 (2,720)	58 (68)	14.2	17.6 (28.9)		511	718 (695)	71 (74)	17.2	16.4 (25.2)	84	57 (57)	25.8	20.0 (20)
2,555.6	3,365 (3,230)	76 (79)	38.0	6.2 (18.8)		635	752 (810)	84 (78)	24.3	4.7 (16.5)	72	49 (51)	21.7	20.0 (20)
2,728.8	- (3,710)	- (74)	6.8	-		768	- (905)	(85)	20.9	- (11.7)	69	(42)	26.4	- (20)
3,144.0	-	-	15.2	-		876	-	-	14.1	-	60	-	28.8	-
3,648.0	-	-	16.0	-		1,091	-	-	24.5	-	53	-	32.8	-
15.4	267 (237)					17.9	26.7 (257)							

Values in brackets are estimates under 1144-SYR
connected system only.

SYRIA
MEHARDEH THERMAL POWER PROJECTS
(Loan 986-SY Only)

Sales (GWh) - Actual vs. Estimate

	-- Domestic and Commercial --			--- Official and Lighting ---			----- Industrial -----			----- Irrigation -----			----- Exports -----		
	Actual	Estimate	% of Estimate	Actual	Estimate	% of Estimate	Actual	Estimate	% of Estimate	Actual	Estimate	% of Estimate	Actual	Estimate	% of Estimate
1970	244.6	-	-	46.6	-	-	243.2	-	-	81.3/1	-	-	-	-	-
1971	262.7	-	-	52.1	-	-	270.1	-	-	132.7/1	-	-	-	-	-
1972	277.7	-	-	55.8	-	-	59.0	-	-	144.8/1	-	-	-	-	-
1973	297.8	-	-	50.6	-	-	335.4	-	-	132.1/1	-	-	-	-	-
1974	372.6	287	130	54.0	65	83	501.4	433	116	7.0	100	7	-	-	-
1975	465.8	335	139	74.0	70	105	553.2	865	64	8.0	120	7	-	-	-
1976	540.3	313	172	110.2	80	138	637.9	1,435	45	32.5	130	25	-	-	-
1977	614.9	351	175	134.9	96	141	787.0	1,968	40	41.0	280	15	43.3	-	-
1978	744.8	377	198	176.4	105	168	820.9	2,288	36	50.0	400	13	59.4	-	-
1979	954.5	394	242	230.4	120	192	1,138.2	2,351	48	65.2	500	13	167.3	-	-
1980	1,078.0	-	-	236.0	-	-	1,273.8	-	-	74.2	-	-	66.8	-	-
1981	1,231.0	-	-	282.0	-	-	1,496.7	-	-	88.3	-	-	46.0	-	-
1982	1,471.0	-	-	333.0	-	-	1,606.4	-	-	108.6	-	-	129.0	-	-

/1 Supply to Thawra Construction

SYRIA

MEHARDEH I AND II THERMAL POWER PROJECTS

PEE

Income Statements for the Years Ending December 31, 1974-1982 - Appraisal Estimates vs. Actuals
(LS Millions)

	<u>1974</u>			<u>1975</u>			<u>1976</u>			<u>1977</u>		
	<u>Appraisal Estimate</u>		<u>Actuals</u>	<u>Appraisal Estimate</u>		<u>Actuals</u>	<u>Appraisal Estimate</u>		<u>Actuals</u>	<u>Appraisal Estimate</u>		<u>Actuals</u>
	<u>Meh. I</u>	<u>Meh. II</u>		<u>Meh. I</u>	<u>Meh. II</u>		<u>Meh. I</u>	<u>Meh. II</u>		<u>Meh. I</u>	<u>Meh. II</u>	
Sales - GWh	885	890	934	1,390	1,120	1,102	1,960	1,680	1,320	2,655	2,110	1,621
Average Revenue/kWh - Piastres	11.0	12.3	12.9	10.5	12.2	12.7	10.2	11.0	14.1	10.6	10.3	13.5
<u>Operating Revenues</u>												
Revenue from Sale of Electricity	97.3	109.5	121.2	146.0	136.6	139.9	200.0	184.8	185.6	281.4	217.3	219.5
Other Revenues	<u>6.2</u>	<u>10.0</u>	<u>2.8</u>	<u>6.7</u>	<u>10.0</u>	<u>14.5</u>	<u>7.2</u>	<u>10.0</u>	<u>29.8</u>	<u>7.7</u>	<u>10.0</u>	<u>44.5</u>
Total Operating Revenues	<u>103.5</u>	<u>119.5</u>	<u>124.0</u>	<u>152.7</u>	<u>146.6</u>	<u>154.4</u>	<u>207.2</u>	<u>194.8</u>	<u>215.4</u>	<u>289.1</u>	<u>227.3</u>	<u>264.0</u>
<u>Operating Expenses</u>												
Personnel	37.8	35.6	52.8	40.0	37.1	66.5	47.2	40.8	95.2	50.8	49.0	104.5
Fuel	36.8	25.9	33.3	32.5	14.9	38.9	26.0	23.5	24.7	33.5	11.8	19.0
Purchase Power	14.8	13.9	23.9	-	24.0	11.5	-	16.5	37.7	-	-	52.0
Spares and Materials ^{1/}	5.5	12.5	8.6	8.0	9.4	11.3	10.0	12.1	1.7	10.5	10.1	2.2
Maintenance, Repairs and Other Expenses ^{1/}	4.2	4.5	7.1	13.2	4.6	9.3	22.5	4.7	28.8	36.3	4.8	39.1
Depreciation	<u>18.4</u>	<u>19.0</u>	<u>26.6</u>	<u>30.1</u>	<u>32.0</u>	<u>35.0</u>	<u>48.1</u>	<u>50.4</u>	<u>35.5</u>	<u>65.9</u>	<u>77.3</u>	<u>42.8</u>
Total Operating Expenses	<u>117.5</u>	<u>111.4</u>	<u>152.3</u>	<u>123.8</u>	<u>122.0</u>	<u>172.5</u>	<u>153.8</u>	<u>148.0</u>	<u>223.6</u>	<u>197.0</u>	<u>153.0</u>	<u>259.0</u>
Net Operating Income (Loss)	<u>(14.0)</u>	<u>8.1</u>	<u>(28.3)</u>	<u>28.9</u>	<u>24.6</u>	<u>(18.1)</u>	<u>53.4</u>	<u>46.8</u>	<u>(8.2)</u>	<u>92.1</u>	<u>74.3</u>	<u>4.4</u>
Net Interest	2.3	0.6	2.5	4.1	4.8	1.2	4.3	3.2	4.5	5.4	3.0	17.0
Other Income	0.8	0.5	8.8	0.8	0.5	2.5	0.8	0.5	(6.8)	0.8	0.5	(3.9)
Net Surplus for Year (Loss)	<u>(15.5)</u>	<u>8.0</u>	<u>(22.0)</u>	<u>25.6</u>	<u>20.3</u>	<u>(16.8)</u>	<u>49.9</u>	<u>44.1</u>	<u>(19.5)</u>	<u>87.5</u>	<u>71.8</u>	<u>(16.5)</u>
Rate of Return on Average Net Fixed Assets - %	-	2.5	-	5.0	4.7	-	6.2	5.2	-	7.4	5.1	0.5

^{1/} Classification of expenses may have been on different bases in the estimates and actuals.

SYRIA

MEHARDEH I AND II THERMAL POWER PROJECTS

PEE

Income Statements for the Years Ending December 31, 1974-1982 - Appraisal Estimates vs. Actuals
(LS Millions)

	-----1978-----			-----1979-----			-----1980 /5-----		---1981 /5---	---1982 /5---
	<u>Appraisal Estimate</u>		<u>Actuals</u>	<u>Appraisal Estimate</u>		<u>Actuals</u>	<u>Appraisal Estimate</u>		<u>Actuals /6</u>	<u>Actuals /6</u>
	<u>Meh. I</u>	<u>Meh. II</u>		<u>Meh. I</u>	<u>Meh. II</u>		<u>Mehardeh II</u>	<u>Actuals /6</u>		
Sales - GWh	3,170	2,720	1,861	3,365	3,230	2,531	3,710	2,880	3,340	4,064
Average Revenue/kWh - Piastres	10.7	13.4	13.8	11.4	14.0	14.3	13.8	17.3 /7	21.6	21.8
<u>Operating Revenues</u>										
Revenue from Sale of Electricity	339.2	363.3/3	257.5	383.6	451.0	361.4	513.1	491.0	718.0	892.0
Other Revenues	8.2	10.0	60.5	8.7	10.0	63.3	10.0	99.0	91.0	143.0
Total Operating Revenues	347.4	373.3	318.0	392.3	461.0	424.7	523.1	590.0	809.0	1,035.0
<u>Operating Expenses</u>										
Personnel	54.2	60.7	134.3	57.3	72.5	134.9	83.8	217.0	300.0	370.0
Fuel	27.8	22.1	37.4	34.1	30.9	78.8	44.8	106.0	335.0	755.0
Purchase Power	-	-	75.8	-	-	72.0	-	73.0	75.0	78.0
Spares and Materials 1/	11.0	13.7	2.6	14.5	16.0	2.2	19.2	10.0	17.0	17.0
Maintenance, Repairs and Other Expenses 1/	51.1	4.9	53.3	55.8	5.0	82.0	5.1	69.0	84.0	97.0
Depreciation	70.5	100.7	48.9	84.0	114.9	58.1	116.2	66.0	108.0	144.0
Total Operating Expenses	214.6	202.1	352.3	245.7	239.3	428.0	269.1	541.0	919.0	1,461.0
Net Operating Income (Loss)	132.8	173.2	(34.3)	146.6	221.7	(3.3)	254.0	49.0	(110.0)	(426.0)
Net Interest	10.3	20.6	63.1	19.6	40.1	171.3	38.7	40.0	47.0	50.0
Other Income	0.8	0.5	26.9 /4	0.8	0.5	1.6	0.5	-	-	-
Net Surplus for Year (Loss)	123.3	153.1	(70.5)	127.8	182.1	(173.0)	215.8	9.0	(157.0)	(476.0)
Rate of Return on Average Net Fixed Assets - %	9.4	9.0	-	9.4	10.3	-	11.6	6.3	-	-

1/ Classification of expenses may have been on different bases in the estimates and actuals.

2/ Actuals of depreciation are based on the historical cost of fixed assets excluding Thawra assets. Depreciation on the Thawra assets is presumed to be covered by the price of purchased power of LS 0.03/kWh.

3/ Assumed an average tariff increase of 33% effective January 1978.

4/ Includes a Government subsidy of LS 31.8 million.

5/ Appraisal estimates for Mehardeh I were only for the period through 1979 and those for Mehardeh II only through 1980.

6/ PEE's estimates. Audited accounts of PEE are available only through 1979.

7/ Reflects an average 50% tariff increase from July 1, 1980.

SYRIA

Mehardeh Thermal Power Projects
(Loans 986-SYR and 1144-SYR)

Rate of Return on Projects
(US\$ millions)

	Capital Cost				Total	Fuel, Operations and Maintenance Cost					Total Cost	Required Benefits for R.O.R. 12%	Required Benefits for R.O.R. 0%	
	Mehardeh	Transmission Lines	Substations	Distribution		Fuel Cost	Fuel Savings	Mehardeh	Transmission Substations	Distribution				Total
1974	0.2	0.6	-	-	0.2						0.2			
1975	17.9	3.3	1.3	-	22.5						22.5			
1976	24.3	3.4	2.2	-	29.9						29.9			
1977	49.5	2.1	0.6	-	52.2				0.1	0.1	52.3			
1978	27.0	1.8	0.6	48.7	28.1				0.2	1.5	79.8			
1979	8.1	2.8	1.0	29.2	41.1	6.5	(3.5)	5.6	0.2	2.3	52.2	5.5	5.5	
1980	6.9	2.3	1.0	20.4	30.8	10.1	(8.1)	5.3	0.2	2.9	41.2	8.3	8.3	
1981	0.3	2.2	0.4	29.5	32.4	18.0	(8.1)	5.1	0.3	3.8	19.1	15.6	15.6	
1982						21.1	(7.4)	5.1	:	:	22.9	15.7	15.7	
1983						22.6	(5.8)	8.5	:	:	29.4	14.3	14.3	
1984						24.2	(4.2)	9.2	:	:	33.3	20.0	109.3	
1985						:	(2.6)	:	:	:	34.9	:	:	
1986						:	(0.9)	:	:	:	36.6	:	:	
						:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
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						:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
						:	:	:	:	:	:	:	:	
2004						24.2		9.2	0.3	3.8	36.6	20.0	109.3	51.7
Present Value at 12%											324.0	80.4	324.0	
Present Value at 0%											1,145.5		1,145.1	

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SYRIA

MEHARDEH I AND II THERMAL POWER PROJECTS

PEE

Draft Project Completion Report by PEE's Consultants

Project Background

Origin of the Project

1. The idea of building the plant to be ultimately known as the Meyadin electric power plant originated as part of a comprehensive system development study prepared in 1972/73. The main findings emerging from the study concluded that the system's production capacity should be expanded at the following pace:

- by three additional 125 MW generating units over the period 1975/80;
- by another three 125 MW units over the period 1980/85;
- by a series of additional 250 MW units subsequent to 1985.

2. The study designated the coastal city of Baniyas (Banias), where plans called for construction of a refinery, as the site of the first four 125 MW power units, with the following two units to be installed in Jazirah (Djezireh) and the future 250 MW units planned for Damascus and Homs (on the shores of Lake Kattineh).

3. These findings were based on a single essential fact- that of the planned start-up of the Thawra hydroelectric plant (800 MW - 1,600 GWh/year), which would satisfy peak power needs for several years, but which at the same time revealed the need for a supplementary thermoelectric facility at some point over the period 1977/78.

4. A formal competitive bidding procedure was initiated as early as 1973 for the first two 125 MW units.

5. However, with the onset of the 1973 war, a number of considerations militated against the construction of a series of power plants along the coast. Thus began the search for a new site, finally resulting in the selection of Meyadin (Mehardeh), the current site of the electric power plant.

6. The following is a brief outline of the major reasons behind the choice of the Meyadin area as the site of the power plant:

- the coast was ruled out for military reasons.

- the site had to have its own water supply, with at least enough to furnish make-up water for a cooling system of wet cooling towers, a need which virtually limited the choice of sites to the following three areas: the Jazirah, the shores of the Euphrates River and the Central Lakes area (Rastane, Kattineh, Meyadin).
- the Jazirah and Euphrates River sites were ruled out by the need to convey power over extremely large distances, with Northern Syria showing a power surplus as a result of the Thawra hydroelectric plant and the South experiencing considerable power shortages.
- the Kattineh Lake area was ruled out for a number of reasons, but the primary concern in this case was to avoid a deliberate concentration of generating facilities along the shores of this lake.
- thus, the final choice was between Rastane and Meyadin, whereupon a number of specific factors finally tipped the scales in favor of Meyadin.

Feasibility--Formal Competitive Bidding--Contracts

7. The 1973 war not only changed the site of the plant, but also modified the entire energy environment in which the new electric power plant was to be constructed. What happened in effect was that a large number of gas turbines had been installed at different points throughout the country in an effort to mitigate the effects of the destruction of existing power plants as rapidly as possible. Moreover, several new industrial projects had been launched or were scheduled for implementation in the immediate future.

8. The need to begin work on the first 125 MW power unit as quickly as possible was more than obvious. After a rapid study of the Meyadin site, a document was sent early in 1974 to the firms previously consulted on the Baniyas plant to enable them to revise their proposals and present a tender adapted to the new project site in Meyadin, offering the second power unit solely as an option. The tenders were received in April of 1974.

9. A feasibility study for what was referred to as the "second phase of work" (with the first phase corresponding to the first generating unit and power stations) and specifically referring to the second generating unit in the Meyadin power plant indicated the advisability of more or less adhering to the initially scheduled date for start-up of this second unit.

10. After a long negotiation process, a turnkey contract was signed on 11/24/74 with an expatriate firm.

Role of the Electric Power Plant in the Country's Long-Term Plan

11. The Thawra hydroelectric facility on the Euphrates River, with an installed capacity of 800 MW and average productibility initially evaluated at 1,600 GWh/year and currently as high as 2,300 GWh/year will satisfy peak power

demand for several years to come (with its task made that much easier with completion of its buffer reservoir) and, in general, will cover all unexpectedly high power usage thanks to its considerable storage capacity, most of which would be used for carry-over storage from the spring floods, but which also introduces a large measure of flexibility with respect to the utilization of other plants connected into the main network.

12. On the other hand, the Thawra hydroelectric plant is, in itself, far from able to satisfy one hundred percent of Syrian demand for electric power and this gap will obviously only widen with time.

13. Consequently, the role of the Meyadin power plant is briefly that of a typical basic power plant whose main purpose is to supply certain kilowatt-hours of electricity, for which the need to turn out a specific amount of power at any one point in time is only secondary or incidental.

14. Obviously, this somewhat rough description of the role of the Meyadin power plant warrants certain qualifications, particularly in view of the problems encountered in conveying the energy produced in Thawra into the Damascus area during peak hours of use and the fact that the Thawra buffer reservoir is not yet operational.

15. The degree of flexibility of the Thawra hydroelectric plant will decline over the coming years, primarily as a result of constraints imposed by plans for the large-scale development of irrigation throughout the Euphrates River area. We can also expect a simultaneous, slight decline in its average productibility. An increase in the number of thermoelectric plants will, naturally, compensate for this dual loss.

16. All this explains why the plans call for an average usage of approximately 5,500 hours/year for the Meyadin facility once over its growing pains and the inevitable confusion associated with its initial period of operation, i.e., beginning three or four years after the plant is placed in service. (This is only an average figure inasmuch as the uncertainties associated with river flow and the production of hydroelectric power could in themselves mean a significant deviation from the aforesaid value.)

17. On a concluding note, assuming the establishment and systematic operation of an integrated or interconnected system by Syria and its neighboring countries, it may become necessary to use one hundred percent of the power produced by the Thawra hydroelectric facility to satisfy peak demand, whereby the Meyadin plant could also be called upon to some extent to help cover this peak demand.

Project Description

18. The plant includes two identical generating units with net power of 142 MW. (The bidding documents left a certain amount of leeway with respect to the power of these units.)

19. The main characteristics of the generating units are as follows:

Boilers

Manufacturer: An expatriate firm
Out-door installation with covering at the top of the boiler.
Natural circulation, single-tank model with length of 10.2 m and outer diameter of 1.775 m.
Steam production in continuous, regular operation: 465t/h.
Maximum tank pressure (test plate): 155 bars
Superheated steam temperature: 543 degrees centigrade.
Resuperheated steam temperature: 543 degrees centigrade
Primary fuel: heavy fuel-oil
Replacement fuel: crude oil
Burning fuel: gas-oil
Pressurized furnace
2 single-inlet, centrifuga blowers, 1,500 r.p.m.
Burners: 12 angled, tilttable burners
Method of regulating superheating and resuperheating: by tilting burners, water injection and recycling of steam
Air reheater: LJUNGSTROM model
Pneumatic heat control

Chimney (one per unit)

Concrete shaft with a brick inner lining
Height: 125 meters

Turbine

Manufacturer: An expatriate firm
Number of casings: 3
Number of exhausts: 2
Intake pressure: 129 bars
Intake temperature: 540 degrees centigrade
Reentry pressure following resuperheating: 31 bars
Reentry temperature: 540 degrees centigrade
Rotating speed: 3,000 r.p.m.
Maximum continuous power: 150 Mw
Number of bleedings: 5

Condenser

Exchange surface: 6,564 square meters

Extraction Pumps

Quantity: 2
Type: vertical shaft centrifugal pump
Maximum flow: 430 m³/h
Rotating speed: 1,490 r.p.m.
Engine power: 311 kW

Degassing Feed Tank

Capacity: 140 cubic meters

Feed Pumps

Quantity: 2

Type: 8-stage centrifugal pumps

Maximum flow: 518 m³/h

Total manometric head: 1,674 m/CE

Maximum rotating speed: 4,750 r.p.m.

Electric driven by a 3,300 kW engine with 1,500 r.p.m., complete with speed multiplier and hydraulic coupler

Circulating Pump

Quantity: 1

Total manometric head: 18.5m

Flow: 19,000 m³/h

Atmospheric Coolant

Forced-draft, cross-current model
5 cells with top ventilator

Alternator

Rated power cosine ϕ 0.80: 187.5 MVA

Interphase voltage: 12 kV

Hydrogen-cooled

Main Transformer

Double-wound, three phase transformer

Power: 187.5 MVA

Voltage: 12/230 kV

Coupling: Yn d 11

No-load voltage ratios: $\pm 2.5\%$ - $\pm 5\%$

Auxiliary Transformer

Double-wound, three-phase transformer

Power: 14 MVA

Voltage: 12/5.8 kV

Coupling: Yn d 11

No-load voltage ratios: $\pm 2.5\%$; $\pm 5\%$

20. There is also certain equipment which is shared by the two generating units but associated from the contractual point of view with unit number 1. This includes, but is not limited to, the following major types of equipment:

Starting and Emergency Transformers

Quantity: 2
Power: 14 MVA
Voltage: 12/5.8 kV
Coupling: Yn d 11
No-load voltage ratios: $\pm 2.5\%$; $\pm 5\%$

Primary Fuel Storage

Total volume: 2,900 cubic meters
Number of tanks: 2
Type of tank: floating roof tanks
Unit capacity of each tank: 1,450 m³
Height: 14.7 m
Diameter: 12.2 m

Water Pumps (installed in the lake)

Mounted on floating pontoons according to variations in the water level
Quantity: 2
Type: vertical shaft centrifugal pumps
Flow:
Manometric head:

Make-up Water Treatment Station

Number of treatment lines: 2
Unit capacity: 100 m³/h
Composition: sand filter - cation exchanger - degasser - anion exchanger - mixed-bed exchanger

The following information is equally interesting.

Foundations

21. All foundations are direct. While the use of piles was considered unnecessary, the discovery of underground cavities lead to the performance of special soil consolidation work (see Section 3.4 below).

General Layout of the Power Plant

22. The general layout of the power plant bears the vivid marks of certain measures taken to replace heavy fuel by crude oil as the plant's substitute fuel. More concretely:

- The boiler room end of the machine room is enclosed by a 10-meter high concrete wall without any openings.
- The boiler-room area is specially treated to minimize the risk of fire.
- The control room and generating rooms are alongside the transformer sets.
- The plant's fuel is stored in floating-roof tanks.

Siding

23. A special architectural study led to the use of polychrome. The colors were chosen according to local custom.

Progress of Work

24. The following is an outline of important dates marking the progress of work on the Meyadin electric power plant:

- Date of signature of Contract No. 500
(for both generator sets).....November 24, 1974
- Site acceptance
- First exploratory soil surveys.....April 1975
- Beginning of earthwork.....June 1975
- First pouring of concrete
(Chimney No. 1).....November 1975

	<u>First Unit</u>	<u>Second Unit</u>
Begin boiler assembly	April 1976	September 1976
Begin metal framework machine room and outbuildings	July 1976	
Arrival of first condenser parts	February 1977	March 1977
Completion machine room enclosure	June 1977	July 1977
Begin turbine assembly per se	June 1977	August 1977
Completion turbine mechanical assembly	March 1978	May 1978
Alternator installed	June 1978	September 1978
Bleedings - steam	January 1979 & February 1979	September 1979 & October 1979
First coupling	April 1979	December 1979
Actual start-up	May 1979	January 1980
Performance tests	July 1979	January 1980
Provisional acceptance	August 1979	February 1980

25. Aside from certain incidents of varying importance, construction of the electric power plant was hindered by a number of substantial problems, as described below:

A. Underground Cavities

26. In view of the events leading to signature of the construction contract (see Section 2.2 above), no soil surveys had been conducted prior to this date, with the contract itself providing for the performance of a series of exploratory soil surveys. The drilling later revealed the existence of underground cavities at various depths and of various sizes, possibly as large as several meters.

27. This discovery led to the performance of one, and later two, additional drilling campaigns in an effort to better identify the problem, inasmuch as there was a considerable variation in soil characteristics from one spot to another. At the same time, the previously accepted foundation system (direct foundations on footings) was also reconsidered. Mr. DUBERTRET, an eminent specialist in karstic structures (the type of structure which it soon became apparent was necessary in this particular case) made a special field trip to the project site. The need for soil consolidation work was discussed at length. Finally, in the interests of caution, the decision was made to proceed with injections under the most critical areas of the plant (the chimneys and generating units.) However, the injections (made through two wells located outside the machine room as far as the generating units were concerned) were postponed until completion of all construction work in an attempt to minimize their effect on overall progress. All in all, they had little impact on plant construction.

B. Events in Lebanon

28. The events in Lebanon beginning in 1975 and continuing thereafter resulted in minor and at times major interruptions in supplies of materials and semi-finished products traditionally procured within the region. As a result, workers at the construction site ran short of supplies on a number of occasions, which partially explains why certain aspects of the civil engineering work proceeded so slowly.

C. Problems Associated with Shipment of the Alternators

29. As certain reinforcements of engineering structures along the Tartus-Meyadin road were not completed on schedule, the two alternators were held up in the port city of Tartus for twelve and nine months, respectively.

30. This explains the glaring anomaly in the calendar presented above in which we saw that the alternators were not installed until several months after completion of mechanical assembly work on the turbines.

31. This delay in receiving the alternators in turn pushed back final start-up of the generator units by a more or less identical number of months.

D. Fuel Discharge Terminal

32. For a number of reasons and primarily as a result of a comprehensive review of the plant's fuel supply system per se, ultimately leading to a decision in favor of the railroads, the discharge terminal was not completed until after the power plant was already in operation. Consequently, the plant was initially supplied with needed fuel by trucks offloaded in a somewhat improvised, temporary facility.

33. The following is an outline of the major operational problems encountered at the time of plant start-up and during its initial period of operation.

Miscellaneous Problems Associated with Plant Start-Up

A. Water Treatment

34. There were a number of different problems associated with the preparation of demineralized water, as follows:

- The initial problems concerned needed supplied of chemicals.

Subsequent problems included that of the proliferation of algae in the lake water.

35. To overcome this second problem, the raw water buffer reservoir had to be converted into a decanter (operating in cycles), with this latter constraint in turn overcome by using water drawn from wells drilled near the project site in the preparation of demineralized water.

B. Flexible Burner Couplings

36. Several leaks were discovered in the flexible burner couplings, all of which were replaced by the Contractor.

C. Adjustment of Boiler Float Level

37. This was a long, drawn-out process of adjustment, with the alarms being triggered on several occasions as a result of sudden drops in boiler float levels.

Project Cost

38. The value of Contract No. 500 before price escalation was as follows, with all totals calculated based on the following conventional exchange rates: 1 FF = £0.85; 1 DM = £2.00

	<u>FF</u> (millions)	<u>DM</u> (millions)	<u>£(Syrian)</u> (millions)	<u>TOTAL IN</u> <u>MILLIONS OF £</u>
Mehardeh I	179	24	31	231
Original contract value	280	46	49	382
Combined value of all riders	6	0	3	9
TOTAL				391
Contractor's claim for injections not paid by E.P.E.				4
GRAND TOTAL				395

The aforesaid supplementary charges represent the following percentages of the original contract price:

- Injections 1.0%
- Total riders, excluding injections 2.4%
- For a total of: 3.4%

(These supplementary costs do not include the fuel discharge terminal.)

Operations

The Electricity Market

39. The graphs presented on the following page show the projections developed through the use of three different methods (analytical, statistical and multiple correlation) late in 1974 ("Feasibility Study for the Second Phase of Work," published in January 1975), along with the actual values subsequently recorded with respect to annual output and peak power provided by the Syrian interconnected power network (the values for 1980 were obtained by extrapolation based on values for the first nine months of 1980). The graphs illustrate the following facts as concerns output and peak power:

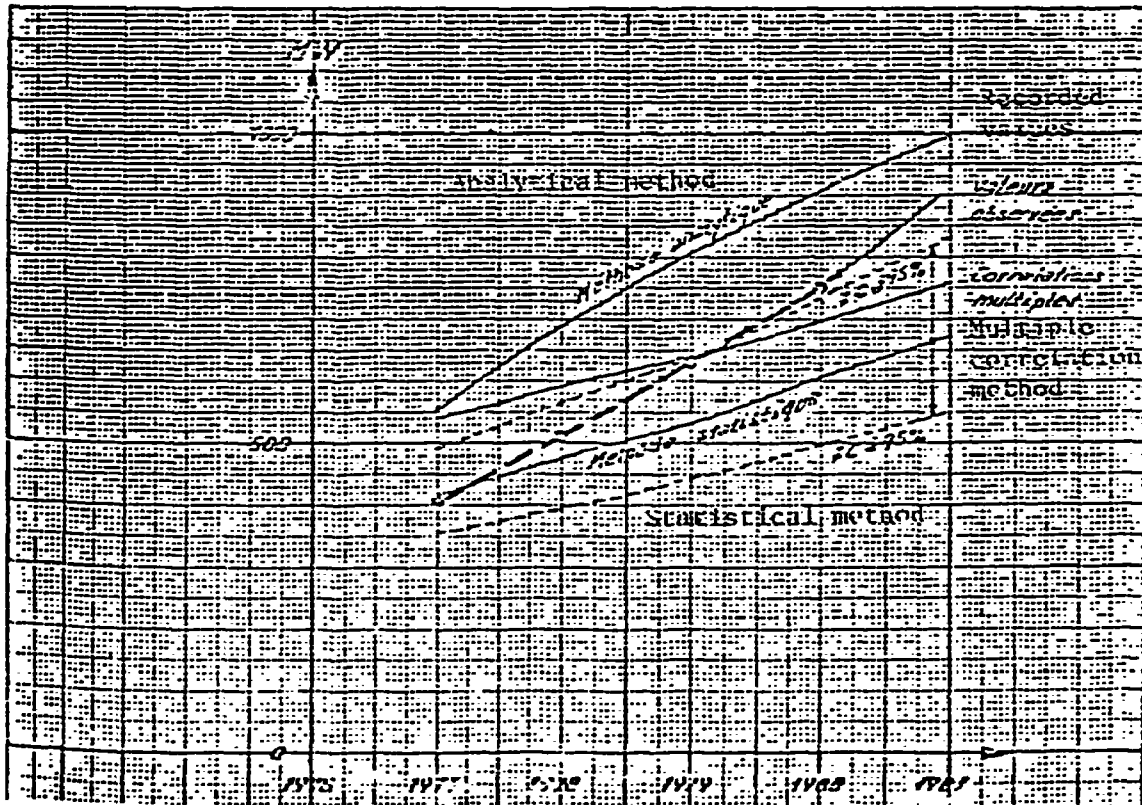
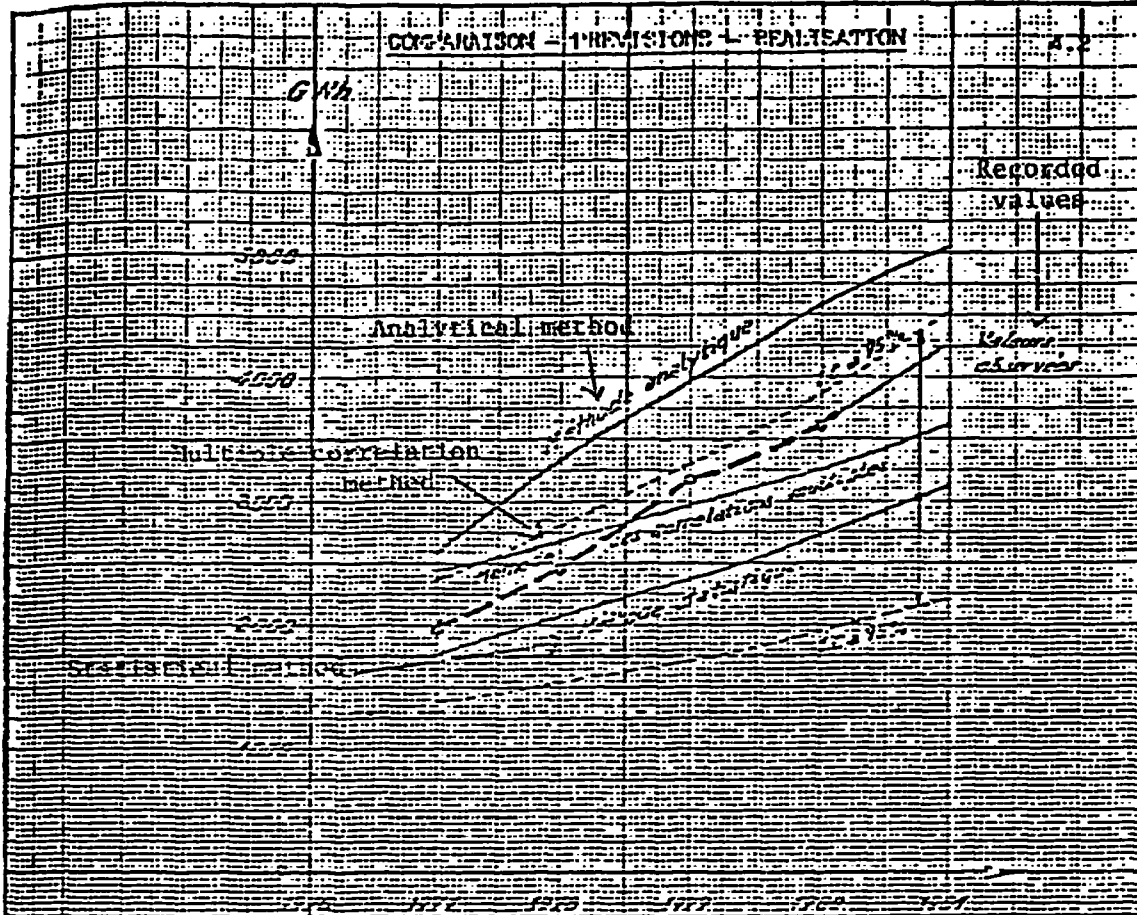
- In 1977, recorded values were virtually identical to the values computer statistically.
- Beginning in 1977, actual trends run virtually parallel to those predicted by the analytical method, catching up with and even surpassing the projections developed using the multiple correlation method.

The average rates of progress or growth for the period 1977-1980 are as follows:

- annual output: 22% per year
- peak power: 22% per year.

These identical growth rates in turn reflect a consistent number of hours of peak use on the order of 4,800 hours/year, or a load factor of 0.55.

COMPARISON OF PROJECTED AND RECORDED VALUES



Plant Power Production

40. Operation of the two phases or generating units included in the Meyadin power plant in the interval between the initial date of coupling and October 31, 1980 is characterized by the following aggregate values:

	?????End 1981?????		End 1982	
	<u>UNIT 1</u>	<u>UNIT 2</u>	<u>UNIT 1</u>	<u>UNIT 2</u>
A. Number of hours since the initial coupling	13,766	7,930	32,750	26,914
B. Number of hours of operation since the initial coupling	6,793	3,121	18,525	16,872
C. B/A	0.49	0.39	0.57	0.63
D. Power produced since the initial coupling (MWh)	707,070	275,190	1,876.6	1,567.2
E. Number of hours of use of the unit's installed capacity since the initial coupling (D/142)	4,984	1,938	13,215	11,037
F. Average output during operating hours (D/B) (in MW)	104	88	101	93
G. Use factor during operation hours based on $P_N = 142\text{MW}$ (F/142)	0.73	0.62	0.71	0.66
H. Average production over total interval (DA) (MW)	51	34	57	58
J. Use factor over total interval based on $P_N = 142\text{MW}$ (H/142)	0.36	0.24	0.40	0.41
K. Average annual number of hours of use of the unit's installed capacity (J x 8,760)	3,171	2,106	3,504	3,592

It is interesting to compare these values with the projections originally developed at the time the project was initially launched. The feasibility study referred to in Section 4.1 above predicted the following number of hours of use of the installed capacity of each generator unit:

- 1,000 over the first six months
- 3,500 over the next year
- 4,500 over the following year
- 5,500 over all subsequent years.

Using this formula to calculate how much power should have been produced by each generating unit, we come up with the following figures:

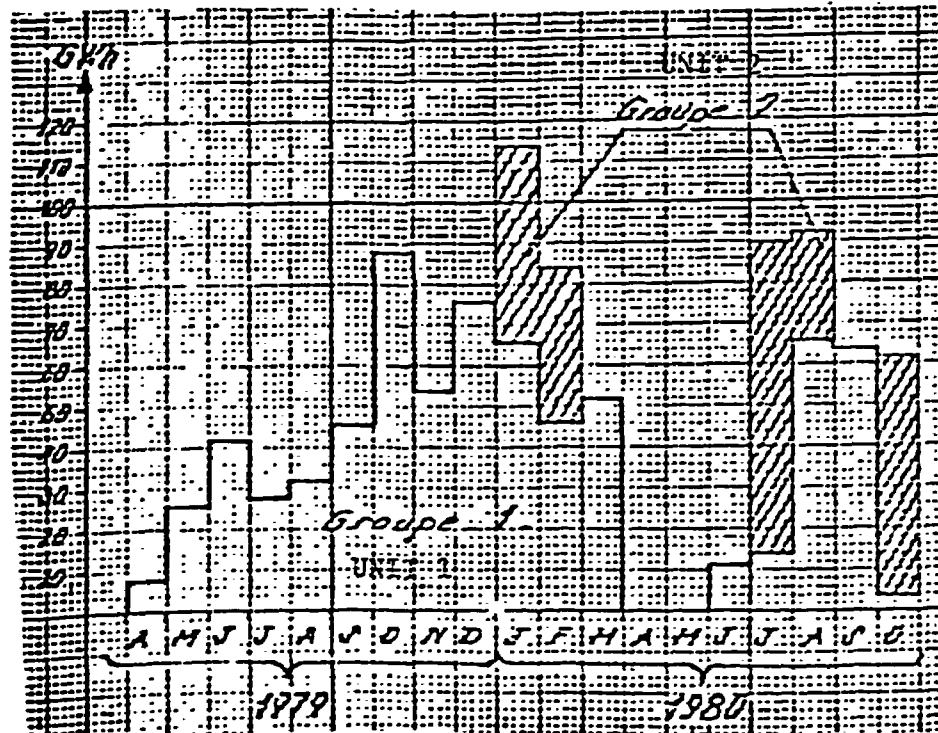
-- For Unit 1, based on 1.57 years of operation as of October 31, 1980:

$$1,000 + 3,500 + (4,500 \times 0.7) = 4,815 \text{ hours}$$

-- For Unit 2, based on 0.91 years of operation as of 10/31/80:

$$1,000 + (3,500 \times 0.41) = 2,430 \text{ hours.}$$

41. The next step is to compare these figures with the values appearing on Line "E" of the preceding table. As concerns Unit 1, the two values are so remarkably close that it can only be a coincidence, considering the imprecise, somewhat arbitrary nature of these projections. As for Unit 2, actual production is significantly lower than the projected value. This calls for a somewhat more detailed analysis of the situation. The following graph shows the amount of power produced by the Meyadin power plant month by month from its initial date of start-up. You can see that the plant was shut down in April and May of 1980- obviously to make certain repairs and adjustments. But the true underlying reason for this shutdown was an abundance of hydroelectric power produced from the floodwaters of the Euphrates, with this spring slack in thermoelectric production accentuated by the higher-than-usual water levels recorded in the spring of 1980.



Consumption

42. Recorded consumption values were as follows:

- 0.243 t/MWh for Unit 1
- 0.245 t/MWh for Unit 2

or:

- 2,345 kcal/kWh for Unit 1
- 2,364 kcal/kWh for Unit 2

These are satisfactory values in that they are practical or working values to be compared against the guaranteed value of 2,375 kcal/kWh (based on an average of different operating modes).

Role of the Electric Power Plant

43. It is safe to say that the role currently played by the Meyadin power plant is roughly equivalent to the role originally assigned to this facility, namely that of a basic power generating facility, with little concern for covering peak demand and with its operating conditions virtually unaffected by the risks and uncertainties associated with hydro production. This is clearly demonstrated by the following series of characteristic figures:

Total Installed Capacity at the End of 1979 and Peak Power Use

Thawra	720 MW
Steam turbines (including Meyadin Units 1 and 2)	432 MW
Gas turbines (based on half the sum of their nominal power)	<u>210 MW</u>
TOTAL	1,362 MW

This total installed capacity is then compared against the following values corresponding to peak power use:

- recorded in 1979: 630 MW
- projected for 1980: 750 MW

demonstrating that there is no a priori problem as concerns the satisfaction of peak power demand and that, on the contrary, there is considerable reserve power, or at least an apparent reserve (see below).

Supply and Demand for Electric Power

44. Power production over the past four years including 1980 (with the values for 1980 extrapolated from figures recorded for the first ten months of the year) can be broken down as follows:

	<u>Total Hydro</u>	<u>Hydro GWh</u>	<u>Steam Turbines GWh</u>	<u>Gas Turbines GWh</u>
1977	1,980	1,768	163	49
1978	2,445	2,134	263	48
1979	3,157	2,195	779	183
1980	3,597	2,471	970	156

In 1978, demand or consumption not only caught up with but actually surpassed maximum hydroelectric productibility, with a sharp increase in thermoelectric production, which subsequently fell off to a certain extent over the period 1979/80 as a result of exceptionally good hydro production for the year 1980.

45. Assuming that demand continues to increase at its current pace, power consumption will reach a level of approximately 4,000 GWh by the year 1981, increasing the share of production of thermoelectric plants to approximately 4,000 - 2,400 = 1,600 GWh, thereby implying a production figure for the Meyadin plant of approximately 1,200 GWh, which is nearly double the figure extrapolated for 1980.

Rate of Return of the Electric Power Plant

46. Referring back once again to the feasibility study mentioned several times throughout the report, in which the plant's profitability or rate of return was studied on the basis of projections developed under an analytical method, we notice a certain amount of slippage in terms of consumption patterns and actual plant start-up, both of which lag behind projections by approximately 1-1/2 years in round figures. This means that what the projections indicated was to take place in early 1978/early 1979 did not actually occur until late 1979/late 1980.

47. However, this simple transposition of the facts over time does not in itself mean that the plant's demonstrated profitability as presented in the feasibility study is in fact valid. The cost of the plant was higher than originally projected and fuel prices have also risen faster than expected.

48. This calls for a new analysis of the situation. If the Meyadin plant (or a similar power plant) had not been constructed, virtually all the power produced by the plant would have had to have been supplied by gas turbines. Using an average price for the past eighteen months of 300 Syrian pounds per ton for heavy fuel and 500 Syrian pounds per ton for gas-oil (these are international prices and not the prices paid by the E.P.E. in Syria), this gives us a unit fuel cost per MWh of power produced which is actually 125 pounds higher than that of the Meyadin plant:

$$(0.43 \text{ t/MWh} \times \text{£}500/\text{t}) - (0.25 \text{ T/MWh} \times \text{£}300/\text{t}) = \text{£}125/\text{MWh}.$$

Therefore, the 983,000 MWh of power produced by the plant as of October 31, 1980 represent a savings of 983,000 x 125 = 122,900,000 Syrian pounds, which in turn represents 31% of the undiscounted cost of the plant, before escalation and monetary erosion.

49. Taking these three phenomena into account means estimating average monetary erosion and using a hypothetical discount rate for the last several years and, in addition, having access to precise and totally accurate information on all payment made under the concept of price escalation, along with their corresponding dates. Thus, the following is only a rough calculation of the effects of these phenomena:

We use the following approximate values:

the interval between the bary-center of payments made under Contract No. 500 and that of fuel payments, or 2-1/2 years (mid-1977 to early 1980);

the effect or rate of price escalation: 15% (with 10% corresponding to escalations which seem to have leveled off);

the combined effect or rate of average monetary erosion and discounting: 16% per year (7% monetary erosion and 8% discount rate in constant currency - $1.07 \times 1.08 = 1.16$).

This 31% becomes 19% in terms of comparable discounted values, as follows:

$$\frac{31\%}{1.15 \times (1.16)^{2.5}} = 19\%$$

This 19% corresponds to a "life" of 1.57 years for Unit 1 and 0.91 years for Unit 2 or 1.24 years, averaging out to 15% for the plant as a whole. This is an extremely good rate of return in that it corresponds to the period immediately following plant start-up and should continue to increase, nearly doubling over the next two years.

50. Nevertheless, the rate of return indicated above does not, in itself, really present a complete picture of plant profitability, which must also take into account other factors such as the cost of transportation facilities associated with fuel shipment, personnel costs, maintenance costs both for the plant itself and for the gas turbines whose utilization has been considerably reduced by plant operation, etc. However, considering that it does reflect the two most important elements of any project evaluation, the rate is definitely high enough to demonstrate the profitability of operating the Meyadin power plant despite the fact that, theoretically, it is not really needed to cover peak power demand.

