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ELECTRICITY PRICING STRATEGY STUDY
APPENDICES

Final Report

Prepared for:

EGYPTIAN ELECTRICITY AUTHORITY
Cairo, Egypt

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APPENDIX A: TERMS OF REFERENCE

EGYPTIAN ELECTRICITY AUTHORITY

Terms of Reference
for
Electricity Pricing Strategy Study

A. Objective

1. The objective of this consultancy is the formulation of an electricity pricing strategy and implementation plan in Egypt, over the medium term.

   Prospective consultants are expected to work closely with the Egyptian Electricity Authority (EEA) in developing and designing tariff structures which reflect as closely as possible the true economic (marginal) costs to the nation of providing electricity supply to different customer segments. This marginal cost structure establishes the fundamental economic frame of reference from the perspective of formulating pricing strategies that promote efficient resource utilization by discouraging waste and resource misallocation; that encourage economically optimal levels of conservation and demand/load management and; direct the usage of electricity to their most valued and productive end-uses.

   As appendix to this terms of reference (TOR) highlights some background information about the power sector in Egypt that is potentially relevant for this study. The following paragraphs present guidelines for the execution of this consultancy:

2. The relevant cost of primary significance to this study are economic (marginal) costs of meeting future system expansion needs. Such an analysis must therefore recognize and correct through "shadow pricing", any major distortions in the observed/financial prices of key factor inputs to the power sector such as fuel costs, cost of capital and foreign exchange, and labor costs.

3. Estimation of the marginal cost structure -- both, the long-run marginal cost (LRMC), as well as the short-run marginal cost (SRMC) -- to different customer segments, and by service voltage and time of use, should be based upon a reference load forecast and the corresponding least cost system expansion plan. Therefore, a review and updating of these key inputs will be required.

4. Calculation of the marginal cost structure should be based upon a method that is generally accepted as having theoretical validity in the applied economics literature and that has been correctly implemented in other such studies.

5. It is recognized that some deviations from pure efficiency pricing may be warranted. For example, in evaluating alternate tariff options within such a pricing framework, due consideration must be given to ensuring that EEA and the distribution companies can earn sufficient revenues to maintain their financial health and thereby ensure their ability to meet the nation's growing demand for electricity in a reliable and economic manner.

   For this purpose key financial performance indicators should be identified, their relevance justified, and target performance levels should be developed for these variables. This analysis of "accounting" (embedded/financial) costs should also provide the minimum revenue requirement target from a financial perspective.

6. Whereas EEA is responsible only for bulk power supply to the distribution companies and to its direct service industrial customers, the analysis in this study must also take into account the economic and financial costs that are relevant to the retail customer segments of the distribution companies.

   Furthermore, comparable consideration should also be given to customers that are not served by the interconnected grid, but that are supplied power from the isolated systems.

7. Some departures from strict economic pricing may also be desirable because of administrative considerations such as metering and billing, customer comprehension and response capability, and to compensate for distortions in the pricing of electricity substitutes. Additionally, sociopolitical objectives such as ensuring the "minimum needs of the poor," will need to be appropriately factored in the pricing strategy, in consultations with EEA.

8. The consultant should recommend an appropriate implementation scheme and schedule for a smooth and efficient transition from the present structure to the new efficiency pricing structure, to buffer the short-term dislocation.

9. The proposed tariff schedules and pricing strategies should provide for automatic adjustment clauses for ex-post increases or decreases in base-line tariffs because of fluctuations in variables such as fuel costs, hydro generation, currency exchange, etc.

10. EEA is evaluating prospects for interconnecting the national grid with some of Egypt's neighbors. Under active consideration at present is an interconnection with Jordan, by sometime in the 1990's. EEA is interested in the appropriate methodological framework for developing tariffs for international power sales as well as examining the impact of such potential interconnections on the marginal cost calculations.

B. Scope of Work

The following tasks should be performed to address the study objectives and approach outlined above.

Task 1: Review of Load Forecast

The purpose of this task is to specify a disaggregated load forecast which will establish the basis for estimating the marginal cost structure in Task 3. The planning horizon for this task is the ten year period 1990-1999.

This effort will begin with a review of EEA's most recent load forecast for the study. If changed circumstances so warrant, this forecast should be adjusted to reflect such changes in key variables exogenous to the forecast. The resultant forecast must be disaggregated by voltage of service, and by major customer classes, in a form suitable for the subsequent marginal cost analysis as well as the financial analysis. In addition, uncertainty about future load growth over the planning horizon should be represented by creating corresponding "high" and "low" forecasts to bracket the likely range of uncertainty.

Task 2: Review of Least Cost Development Program

The purpose of this task is to review the present least (economic) cost expansion program and if necessary, adjust it in accordance with changes to the base load forecast developed in Task 1. If such changes are significant, and if conditions so warrant, then EEA will conduct the necessary runs of the WASP/EGEAS models as specified by the consultants. The output of this task should be the definition of a least cost development program and the corresponding expenditure profile by year -- capital costs, energy costs by fuel type, O&M costs, -- that can be utilized in the subsequent tasks on marginal cost analysis and financial analysis.

Projected annual capital expenditures over the planning horizon for the transmission and distribution program that is consistent with the optimal generation expansion programs will be provided to the consultants by EEA.

Task 3: Economic Cost of Gas in Power Sector

The objective of this task is to assess whether the economic cost of gas in the power sector may differ substantially from its presently assumed value at thermal parity to fuel oil.

It is recognized that a gas utilization study is normally required to develop this cost; and that such a comprehensive evaluation of potential uses and differential values of gas in other sectors is well beyond the scope of this study. However, the consultant is expected to review and analyze available information to establish if a different cost estimate has a stronger economically supportable basis.

It is expected that the review and analysis in this task will help establish an economic cost range estimate for natural gas to be used in the marginal cost analysis task.

Task 4: Analysis of Marginal Cost Structure

The objective of this task is to establish the marginal cost of providing electricity to the different customer groups. Long-run marginal costs (LRMC) should be separately estimated for generation, transmission and distribution capacity, and allocated to appropriately defined peak and off-peak periods, and possibly to mid-peak/shoulder periods as well.

Marginal energy costs of generation should be estimated at different delivery points (voltages) in the network. Furthermore, these costs should also be differentiated, as appropriate, by season of year, and time-of-day (TOD).

The marginal cost analysis should utilize economic costs to correct for distortions in the pricing of major inputs to the power sector such as foreign exchange, labor, fuels, and capital.

The cost of fuel oil and gas oil to EEA is below the corresponding border prices. In addition, the relative price ratio based upon domestic prices differs from the corresponding ratio based upon border prices. To examine the impact of this difference, the LRMC analysis should be repeated with subsidized domestic prices for these fuels.

In addition to the LRMC analysis which is based upon the least cost development program, an analysis of the short-run marginal cost (SRMC) structure should be conducted. These costs at any hour t are to be defined as the sum of a variable fuel and O&M cost of generation ("system lambda"), plus losses in hour t, plus a quality of supply component which can be approximated by failure costs to consumers.[1] The hourly SRMC structure should provide the basis in a subsequent task to identify one or more dynamic pricing options for load/demand management.

Sensitivity analyses should be conducted to examine the impact of the following exogenous variables on the marginal cost structure; fuel prices set at financial cost, variation in Nile river levels, economic cost of natural gas, losses, failure cost.

The marginal cost analysis in this task must also differentiate between the unified power (interconnected) system, and the isolated systems. In addition the analysis should assess whether major spatial cost differences exist within the unified power system.

Task 5: Conduct Financial Analysis

The purpose of this task is to determine the total revenue requirement (LE), and the average revenue requirement (LE/kWh) that will generate sufficient revenues to enable EEA and the distribution companies to function as a viable commercial operation.

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[1] Sometimes also referred to as customer cost of unserved energy, or outage cost.

The study will begin with a review of historic financial performance in the recent past, as well as the process and approach currently utilized for financial planning in the context of revenue requirement projections for tariff design. One or more criteria and corresponding target values should be developed for defining what is considered to be adequate financial performance. These may be based criterias such as rate of return on net fixed assets -- historical and revalued -- self financing ratio, debt coverage ratio, capital structure, etc. The underlying reasons and justification for selecting one or more of these criteria should be provided as well.

Next, the consultants shall prepare financial forecast for the first five years of the forecast period. These projections shall provide forecasts of income and expenditures, sources and uses of funds, and proforma balance sheets. These projections shall incorporate average revenues that have been determined as adequate to achieve the criteria established for viable commercial operation.

Three separate analyses are to be developed in this connection. One analysis should determine EEA's average revenue requirement for bulk power sales, i.e., EEA as a stand alone organization. A second analysis should treat EEA and all distribution companies as one financial entity and determine the corresponding revenue requirement on a national retail level. A third analysis should examine the average financial revenue requirement for each distribution company as a separate organization, where the cost of bulk power purchases from EEA would be incorporated as one item in the operating expenditure schedule.

The results of this financial analyses should help define the average revenue requirements at the bulk supply level as well as a consistent revenue requirement at the retail level.

As a preparatory task to this analysis, the consultants will be expected to review and utilize as appropriate, EEA's asset valuation report which estimates the revalued net fixed assets in service each year.

Task 6: Evaluation of Existing Tariffs

The objective of this task is assess the economic efficiency implications of existing tariffs in light of the marginal cost structure developed in Task 4; and the financial implications in light of the financial analysis in Task 5.

This evaluation will identify the major economic distortions inherent in the present structure. In addition the analysis will identify the extent of financial subsidies and cross-subsidies that are endemic in the present pricing structure.

This examination of the existing tariffs should also pay some attention to associated issues such as metering technology in-place, meter maintenance policies, and the process of meter reading, billing, and revenue collection. This assessment should provide useful insights for designing new tariff proposals as well as identifying needs for improvements in these practices.

Task 7: Formulate Pricing Strategy Based Strictly Upon Marginal Cost Structure

The objective of this task is to define a pricing structure based largely upon economic efficiency considerations and factors such as customer response capability and metering. The latter factors should provide the basis for deciding between a pure energy tariff, a two part tariff of demand and energy charges, a three part tariff, a time of use (TOU) tariff, etc. The evaluation conducted in Task 6, together with the marginal cost structure should point the way to the appropriate re-classification of customer segments, the sizing of different consumption blocks and the corresponding prices, as well as the suitability of TOU pricing, pricing by voltage, etc. The primary emphasis in this task is to formulate tariff proposals motivated largely on efficiency pricing considerations.

Task 8: Adjust Strict LRMC Tariffs for Financial and Other Considerations

In this task, the tariffs proposals developed in Task 7 are to be adjusted to ensure recovery of the financial revenue requirement.

In addition, the revised tariff proposals should be cognizant of the political and social policies of the Government such as concern about meeting the needs of the low income groups, and any geographical or sectoral development emphasis. Furthermore, some adjustments may be necessary to account for distortions in the pricing of competing energy sources to customers, e.g., natural gas in water heating.

This process of adjustment should give consideration to the impacts on typical bills for customers in different segments retail and bulk. In this manner, the final tariff recommendations are to be developed.

With respect to these adjustments, any deviations from efficiency prices must be kept to a minimum, should be clearly identified, and where such deviations are necessary, the extent and incidence of any economic and financial subsidy and cross-subsidy should be clearly identified. In addition, order of magnitude estimates of the resultant price response should be estimated as well.

Another activity in this task will be the development of appropriate adjustment clauses for the baseline tariff recommendations. The desirability of such clauses for fuel cost related adjustments (fuel prices as well as variations in thermal generation because of Nile river flows), and for foreign currency exchange fluctuations should be reviewed, and the clauses structured in light of these findings.

Finally, the consultant shall review the power factor clause in the existing tariffs, and make recommendations for restructuring this clause as appropriate.

Task 9: Implementation Plan for New Tariffs

The focus of this task is on the problem of transition from present tariffs to the new tariff recommendations developed in Task 8. For example, for the very large customers and those customer segments which potentially face bill increases that are judged to be so large as to potentially create significant economic dislocation in the short-run, a phase-in strategy may need to be developed. This includes defining the implementation period and annual price increases. In some instances, a complementary package of other non-price provisions may help to ensure a smoother transition.

In instances where a phase-in period is judged to be necessary, utmost care should be taken in the design of an implementation plan. Incentives, any interim subsidies, or other forms of assistance should be designed to maximize the chances of such customer segments undertaking the necessary cost-effective structural changes, process modifications, and/or energy end-use efficiency improvements, such that the economic impacts are substantially mitigated over the phase-in period.

Task 10: Tariffs for Load/Demand Management

The objective of this task is to utilize the marginal cost information (LRMC and SRMC) developed earlier, to define one or more tariff options which provide strong incentives for load/demand management and for managing system reliability. Such options potentially include:

- interruptible tariffs
- demand subscription service
- dynamic pricing

The analysis in this task should take into account the available data and findings of EEA's ongoing study on load research and load management.

Task 11 : Model(s) and Methodology Transfer and Training :

The purpose of this task is to accomplish the necessary transfer to EEA, of all computer software that is developed or utilized in this study. Such programs and the necessary data inputs should be implemented on EEA's computers, must be accompanied by sufficient documentation, and should be "user friendly". The consultant shall train designated EEA staff in the use of this software . Futher, the software should be flexible and should afford a rapid capability to conduct sensitivity analyses on key data inputs .

The consultant will be required to institutionalize within EEA the capability to develop and regularly undertake tariff revisions by using the methodology and computer models utilized for this study. Training related to the transfer of such models, data, inputs, and methodological capability is considered to be an extremely important part of the consultancy . The consultant shall arrange for the visit of five selected EEA staff to a few us utilities and organizations to be acquainted with tariff design practices and tariff promotion and marketing

Task 12: Reporting :

The Consultants shall provide written reports as follows :

- Inception report to be submitted about four weeks from study commencement. This report will provide futher clarifications of the work plan, schedule, and approach, and identify any substantial departures from the original work plan.

- Progress reports to be submitted monthly. These reports will identify the current status of the study, and identify any major problem areas that may materially delay the on-time completion of the work program or adversely effect its quaiity.

- Draft Final Report to be submitted within six months from the start date. This report will document all aspects of the study including data inputs, methodology, key assumptions, analysis and findings, and recommendations.

- Final Report to be submitted within one month of receipt of comments from EEA and U.S.A.I.D., and will incorporate the comments made on the Draft Final Report.

Three presentations are to be organized during the study period. The first, sometime at the commencement of the study, a second presentation at a convenient juncture sometime midway in the study, and the third shortly after submission of the draft final report.

C. Organization of Study

The information requirements for this pricing study potentially draw upon data and models from a wide range of departments/functions at EEA, and the Distribution Companies, including generation expansion planning, T&D expansion planning, accounting and finance, metering and billing, customer load research, and system operations.

To the maximum extent feasible, the study team will be expected to work in Cairo with the project manager and any other EEA professional staff that any be assigned. However, it is recognized that because of cost and other considerations, certain work elements may be undertaken in the consultant's home office.

EEA's Studies and Research Department has access to a mainframe VAX8200 computer system, a micro VAX200, and IBM-AT and XT personal computers. EEA staff will be available to undertake the necessary runs of in-house models, and to assemble data in a format required by the consultants. If the consultant study team members plan to use special personal computers, they will be expected to bring their own PCs.

EEA will provide the following support, as required by the Consultant for carrying out the Study.

- office space, supplies, and support
- local transportation for work-related activities
- acquisition and provision of documents, data, and information that are at the disposal of EEA, the Ministry, of the Government.

APPENDIX B: SUPPORTING TABLES FOR REVIEW OF LOAD FORECAST

Actual Sales and Generated Energy Data

	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
GDP	17258	20097	22091	23848	25610	26829	27957	29450	30923	32469
Population	42.11	43.33	44.50	45.77	46.99	48.21	49.55	50.94	52.17	53.63
GDP Per Capita	409.8	463.8	496.4	521.0	545.0	556.6	564.2	578.1	592.7	605.4

	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87	1987/88	1988/89	1989/90
VHV Industrial	4186.40	4138.52	4152.00	4773.94	4623.67	4909.63	5370.74	5935.00	6270.00	6628.61
HV Industrial	717.40	658.00	694.39	879.95	1015.61	1167.23	1200.43	1326.11	1366.00	1566.00
Non VHV Industrial	4305.40	4856.10	5538.62	5807.90	6151.79	6735.42	7114.57	7511.89	8054.50	8530.00
Total Industrial	9214.20	9629.62	10322.01	11461.79	11791.07	12812.28	13685.74	14773.00	15690.50	16724.61
		4.5%	7.2%	11.0%	2.9%	8.7%	6.8%	7.9%	6.2%	6.6%
Agriculture	776.60	835.50	897.00	1007.00	1108.00	1197.00	1166.00	1221.00	1265.00	1344.36
Public Utilities	1158.50	1324.30	1683.00	1738.55	1751.77	1963.56	2192.10	2207.00	2165.00	2369.00
Subtotal	11149.30	11789.42	12902.01	14207.34	14650.84	15972.84	17043.84	18201.00	19120.50	20437.97
		5.74%	9.44%	10.12%	3.12%	9.02%	6.71%	6.79%	5.05%	6.89%
Commercial	423.00	563.80	700.70	885.20	1043.00	1194.40	1380.00	1440.80	1526.10	1631.00
Residential	3355.40	4124.30	5055.00	6236.50	7120.60	8058.60	8863.70	9844.00	10440	10031.00
Government	672.20	722.76	821.30	929.05	964.70	983.30	1040.90	1050.70	1218	1392.00
Subtotal	4450.60	5410.86	6577.00	8050.75	9128.30	10236.30	11284.60	12335.50	13184.10	13954.00
		21.58%	21.55%	22.41%	13.38%	12.14%	10.24%	9.31%	6.88%	5.84%
Total Sales (GWh)	15599.90	17200.28	19479.01	22258.09	23779.14	26209.14	28328.44	30536.50	32304.60	34391.97
		10.26%	13.25%	14.27%	6.83%	10.22%	8.09%	7.79%	5.79%	6.46%
Sales to Iso. Sys.	0.00	0.00	17.80	79.00	105.00	117.60	131.62	188.00	197.20	212.20
UPS Sales	15599.90	17200.28	19461.21	22179.09	23674.14	26091.54	28196.82	30348.50	32107.40	34179.77
Sys. Losses	4270.10	5342.72	5582.79	5617.91	6924.86	6762.46	7297.18	7495.50	7472.60	7469.23
(% of Gen.)	21.49%	23.70%	22.29%	20.21%	22.63%	20.58%	20.56%	19.81%	18.88%	17.93%
Total Generation (GWh)	19870.00	22543.00	25044.00	27797.00	30599.00	32854.00	35494.00	37844.00	39580.00	41649.00
G.R %		13.45%	11.09%	10.99%	10.08%	7.37%	8.04%	6.62%	4.59%	5.23%
Peak Load (MW)	3179.00	3694.00	3981.00	4672.00	5158.00	5361.00	5803.00	6152.00	6279.00	6664.00
G.R %		16.20%	7.77%	17.36%	10.40%	3.94%	8.24%	6.01%	2.06%	6.13%
Load Factor	71.35%	69.66%	71.81%	67.92%	67.72%	69.96%	69.82%	70.22%	71.96%	71.35%

Note: GDP figures from Central Bank of Egypt, 1980/81 prices.

Sales and Generated Energy Forecast (Medium Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
GDP	34417	36482	38671	40991	43451	46058	48821	51751	54856	58147
Population	55.13	56.62	58.15	59.78	61.45	63.17	64.94	66.76	68.63	70.55
GDP Per Capita	624.3	644.3	665.0	685.7	707.1	729.1	751.8	775.2	799.3	824.2

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
VHV Industrial	6770.00	6980.00	7054.00	7144.00	7294.00	7344.00	7711.20	8096.76	8501.60	8926.68
Non VHV Industrial	10831.50	11630.80	12489.09	13410.71	14400.35	15463.01	16604.10	17829.38	19145.09	20557.89
Total Industrial	17601.50	18610.80	19543.09	20554.71	21694.35	22807.01	24315.30	25926.14	27646.69	29484.57
Agriculture	1420.46	1499.09	1582.07	1669.64	1762.05	1859.59	1962.52	2071.15	2185.79	2306.78
Public Utilities	2566.88	2764.97	2955.32	3158.78	3376.25	3608.69	3857.13	4122.67	4406.50	4709.87
Subtotal	21608.83	22874.86	24080.48	25383.13	26832.65	28275.29	30134.94	32119.97	34238.98	36501.22
	5.73%	5.86%	5.27%	5.41%	5.71%	5.38%	6.58%	6.59%	6.60%	6.61%
Commercial	1716.76	1881.84	2056.90	2236.17	2424.95	2623.24	2831.02	3048.23	3274.80	3510.59
Residential	11822.19	12777.73	13749.86	14734.71	15728.37	16727.13	17727.43	18725.[illegible]	19719.33	20704.80
Government	1452.19	1560.51	1676.91	1801.99	1936.40	2080.83	2236.04	2402.83	2582.06	2774.65
Subtotal	14991.14	16220.08	17483.68	18772.87	20089.72	21431.21	22794.50	24176.95	25576.18	26990.04
	7.43%	8.20%	7.79%	7.37%	7.01%	6.68%	6.36%	6.06%	5.79%	5.53%
Total Sales (GWh)	36599.98	39094.93	41564.16	44156.00	46922.37	49706.50	52929.44	56296.92	59815.16	63491.26
	6.42%	6.82%	6.32%	6.24%	6.26%	5.93%	6.48%	6.36%	6.25%	6.15%
Sales to Iso. Sys.	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	649.00
UPS Sales	36367.98	38751.93	41056.16	43556.00	46214.37	48869.50	52502.44	55805.92	59251.16	62842.26
System Losses	7929.19	8448.96	8890.51	9367.45	9939.13	10438.15	11136.88	11755.73	12394.74	13054.19
(% of Gen.)	17.90%	17.90%	17.80%	17.70%	17.70%	17.60%	17.50%	17.40%	17.30%	17.20%
Total Generation (GWh)	44297.17	47200.89	49946.67	52923.45	56153.55	59307.64	63639.33	67561.65	71645.90	75896.45
G.R %	6.36%	6.56%	5.82%	5.96%	6.10%	5.62%	7.30%	6.16%	6.05%	5.93%

Notes: GDP figures from Central Bank of Egypt, 1980/81 prices.

Note: Medium scenario assumes average annual GDP growth of 6% (for econometric equations) and average VHV Industrial sales growth of 5% after FY96.

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Peak Demand Forecast (Medium Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
Residential										
Energy (GWh)	11822.19	12777.73	13749.88	14734.71	15728.37	16727.13	17727.43	18725.89	19719.33	20704.80
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	3940.7	4259.2	4583.3	4911.6	5242.8	5575.7	5909.1	6242.0	6573.1	6901.6
Commercial										
Energy (GWh)	1716.76	1881.84	2056.90	2236.17	2424.95	2623.24	2831.02	3048.23	3274.80	3510.59
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	408.8	448.1	489.7	532.4	577.4	624.6	674.1	725.8	779.7	835.9
VHV Sales (Industrial)										
Energy (GWh)	6770	6980.00	7054.00	7144.00	7294.00	7344.00	7711.20	8096.76	8501.60	8926.68
Hours Use	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
Peak (MW)	967.1	997.1	1007.7	1020.6	1042.0	1049.1	1101.6	1156.7	1214.5	1275.2
Non-VHV Industrial										
Energy (GWh)	10831.50	11630.80	12489.09	13410.71	14400.35	15463.01	16604.10	17829.38	19145.09	20557.89
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	2578.9	2769.2	2973.6	3193.0	3428.7	3681.7	3953.4	4245.1	4558.4	4894.7
Public Utilities										
Energy (GWh)	2586.88	2764.97	2955.32	3158.78	3376.25	3608.69	3857.13	4122.67	4406.50	4709.87
Hours Use	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Peak (MW)	431.1	460.8	492.6	526.5	562.7	601.4	642.9	687.1	734.4	785.0
Other Dist. Co. Sales										
Energy (GWh)	2872.65	3059.60	3258.97	3471.62	3696.45	3940.42	4198.56	4473.98	4767.85	5081.43
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	957.6	1019.9	1086.3	1157.2	1232.8	1313.5	1399.5	1491.3	1589.3	1693.8
Total Sales (GWh)	36599.98	39094.93	41564.16	44156.00	46922.37	49706.50	52929.44	56296.92	59815.16	63491.28
Sales to Iso. Sys.										
Energy (GWh)	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	649.00
Hours Use	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
Peak (MW)	66.3	98.0	145.1	171.4	202.3	239.1	122.0	140.3	161.1	185.4
Losses & Co. Use										
Energy (GWh)	7929.19	8448.98	8890.51	9357.45	9939.18	10438.15	11136.88	11755.73	12394.74	13054.19
Hours Use	6100	6100	6100	6100	6100	6100	6100	6100	6100	6100
Peak (MW)	1209.9	1385.1	1457.5	1535.6	1629.4	1711.2	1825.7	1927.2	2031.9	2140.0
Total Energy (GWh)	44207.17	47200.89	49946.67	52923.45	56153.55	59307.64	63639.33	67561.65	71645.90	75896.45
Non-Coinc. Peak (MW)	10518	11241	11946	12705	13513	14318	15384	16335	17320	18341
Coincidence Factor	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%
Peak Load	7152	7644	8123	8640	9189	9736	10461	11108	11778	12472
	7.32%	6.88%	6.26%	6.36%	6.36%	5.95%	7.45%	6.18%	6.03%	5.89%
Load Factor	70.70%	70.49%	70.19%	69.93%	69.76%	69.54%	69.44%	69.43%	69.44%	69.47%

Sales and Generated Energy Forecast (High Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
GDP	34904	37522	40336	43361	46613	50109	53868	57908	62251	66920
Population	55.13	56.62	58.15	59.78	61.45	63.17	64.94	66.76	68.63	70.55
GDP Per Capita	633.1	662.7	693.7	725.4	758.5	793.2	829.5	867.4	907.1	948.5

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
VHV Industrial	6770.00	6980.00	7054.00	7144.00	7294.00	7344.00	7858.08	8408.15	8996.72	9626.49
Non VHV Industrial	11019.08	12037.13	13149.25	14364.11	15691.22	17140.94	18724.59	20454.57	22344.37	24408.78
Total Industrial	17789.08	19017.13	20203.25	21508.11	22985.22	24484.94	26582.67	28862.71	31341.09	34035.26
Agriculture	1439.04	1538.55	1644.95	1758.70	1880.32	2010.34	2149.37	2298.00	2456.91	2626.81
Public Utilities	2545.09	2676.37	2814.42	2959.58	3112.24	3272.77	3441.58	3619.10	3805.78	4002.08
Subtotal	21773.20	23232.05	24662.61	26226.39	27977.78	29768.05	32173.62	34779.81	37603.78	40664.16
	6.53%	6.70%	6.16%	6.34%	6.68%	6.40%	8.08%	8.10%	8.12%	8.14%
Commercial	1788.88	2036.90	2305.89	2589.59	2893.48	3217.38	3560.98	3923.84	4305.36	4704.85
Residential	12050.89	13244.77	14461.32	15693.10	16932.95	18174.09	19410.17	20635.37	21844.43	23032.64
Government	1477.60	1615.60	1766.49	1931.48	2111.87	2309.10	2524.76	2760.56	3018.39	3300.29
Subtotal	15317.37	16897.28	18533.70	20214.16	21938.29	23700.57	25495.92	27319.77	29168.17	31037.78
	9.77%	10.31%	9.68%	9.07%	8.53%	8.03%	7.58%	7.15%	6.77%	6.41%
Total Sales (GWh)	37090.57	40129.33	43196.31	46440.56	49916.07	53468.62	57669.54	62099.58	66771.95	71701.94
	7.85%	8.19%	7.64%	7.51%	7.48%	7.12%	7.86%	7.68%	7.52%	7.38%
Sales to Iso. Sys.	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	0.00
UPS Sales	36858.57	39786.33	42688.31	45840.56	49208.07	52631.62	57242.54	61608.58	66207.95	71701.94
System Losses	8036.16	8674.49	9243.94	9858.78	10583.02	11241.71	12142.36	12978.08	13850.03	14894.61
(% of Gen.)	17.90%	17.90%	17.80%	17.70%	17.70%	17.60%	17.50%	17.40%	17.30%	17.20%
Total Generation (GWh)	44894.73	48460.81	51932.25	55699.34	59791.09	63873.33	69384.89	74586.66	80057.98	86596.54
G.R %	7.79%	7.94%	7.16%	7.25%	7.35%	6.83%	8.63%	7.50%	7.34%	8.17%

Note: High scenario assumes average annual GDP growth of 7.5% (for econometric equations) and average VHV Industrial sales growth of 7% after FY96.

Peak Demand Forecast (High Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
Residential										
Energy (GWh)	12050.89	13244.77	14461.32	15693.10	16932.95	18174.09	19410.17	20635.37	21844.43	23032.64
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	4017.0	4414.9	4820.4	5231.0	5644.3	6058.0	6470.1	6878.5	7281.5	7677.5
Commercial										
Energy (GWh)	1788.88	2036.90	2305.89	2589.59	2893.48	3217.38	3560.98	3923.84	4305.36	4704.85
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	425.9	485.0	549.0	616.6	688.9	766.0	847.9	934.2	1025.1	1120.2
VHV Sales (Industrial)										
Energy (GWh)	6770	6980.00	7054.00	7144.00	7294.00	7344.00	7858.08	8408.15	8996.72	9626.49
Hours Use	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
Peak (MW)	967.1	997.1	1007.7	1020.6	1042.0	1049.1	1122.6	1201.2	1285.2	1375.2
Non VHV Industrial										
Energy (GWh)	11019.08	12037.13	13149.25	14364.11	15691.22	17140.94	19724.59	20454.57	22344.37	24408.78
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	2623.6	2866.0	3130.8	3420.0	3736.0	4081.2	4458.2	4870.1	5320.1	5811.6
Public Utilities										
Energy (GWh)	2545.09	2676.37	2814.42	2959.58	3112.24	3272.77	3441.58	3619.10	3805.78	4002.08
Hours Use	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Peak (MW)	424.2	446.1	469.1	493.3	518.7	545.5	573.6	603.2	634.3	667.0
Other Dist. Co. Sales										
Energy (GWh)	2916.34	3154.16	3411.44	3690.17	3992.18	4319.45	4674.13	5053.56	5475.30	5927.10
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	972.2	1051.4	1137.1	1230.1	1330.7	1439.8	1558.0	1686.2	1825.1	1975.7
Total Sales (GWh)	37090.57	40129.33	43196.31	46440.56	49916.07	53468.62	57669.54	62099.58	66771.95	71701.94
Sales to Iso. Sys.										
Energy (GWh)	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	0.00
Hours Use	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
Peak (MW)	66.3	96.0	145.1	171.4	202.3	239.1	122.0	140.3	161.1	0.0
Losses & Co. Use										
Energy (GWh)	8036.16	8674.49	9243.94	9858.78	10583.02	11241.71	12142.36	12978.08	13850.03	14894.61
Hours Use	6100.00	6100.00	6100.00	6100.00	6100.00	6100.00	6100.00	6100.00	6100.00	6100.00
Peak (MW)	1317.4	1422.0	1515.4	1616.2	1734.9	1842.9	1990.6	2127.6	2270.5	2441.7
Total Energy (GWh)	44894.73	48460.81	51932.25	55699.34	59791.09	63873.33	69384.89	74583.66	80057.98	86596.54
Non-Coinc. Peak (MW)	10681	11585	12484	13456	14493	15543	16899	18161	19481	21069
Coincidence Factor	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%
Peak Load	7263	7877	8489	9150	9855	10570	11491	12349	13247	14327
	8.99%	8.46%	7.77%	7.78%	7.71%	7.25%	8.72%	7.47%	7.27%	8.15%
Load Factor	70.56%	70.23%	69.83%	69.40%	69.26%	68.90%	68.93%	68.95%	68.99%	69.00%

Sales and Generated Energy Forecast (Low Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
GDP	33930.11	35456.96	37052.52	38719.69	40462.28	42283.08	44185.82	46174.18	48252.02	50423.36
Population	55.13	56.62	58.15	59.78	61.45	63.17	64.94	66.76	68.63	70.55
GDP Per Capita	615.40	626.22	637.19	647.73	658.44	669.33	680.40	691.65	703.09	714.71

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
VHV Industrial	6770.00	6980.00	7054.00	7144.00	7294.00	7344.00	7344.00	7344.00	7344.00	7344.00
Non VHV Industrial	10644.50	11232.68	11853.36	12508.34	13199.51	13928.87	14698.54	15510.73	16367.80	17272.23
Total Industrial	17414.50	18212.68	18907.36	19652.34	20493.51	21272.87	22042.54	22854.73	23711.80	24616.23
Agriculture	1401.87	1460.10	1520.74	1583.91	1649.70	1718.22	1789.59	1863.93	1941.35	2021.99
Public Utilities	2545.09	2676.37	2814.42	2959.58	3112.24	3272.77	3441.58	3619.10	3805.78	4002.08
Subtotal	21361.46	22349.15	23242.52	24195.84	25255.45	26263.87	27273.71	28337.76	29458.93	30640.30
	4.52%	4.62%	4.00%	4.10%	4.38%	3.99%	3.34%	3.90%	3.96%	4.01%
Commercial	1645.61	1732.62	1822.62	1910.33	2000.73	2093.83	2189.64	2288.17	2389.42	2493.40
Residential	11591.45	12307.98	13035.08	13771.07	14514.24	15262.93	16015.52	16770.41	17526.10	18281.11
Government	1426.86	1506.55	1590.68	1679.52	1773.32	1872.35	1976.92	2087.32	2203.89	2326.98
Subtotal	14663.92	15547.15	16448.39	17360.92	18288.28	19229.11	20182.07	21145.91	22119.42	23101.48
	5.09%	6.02%	5.80%	5.55%	5.34%	5.14%	4.96%	4.78%	4.60%	4.44%
Total Sales (GWh)	36025.38	37896.30	39690.91	41556.75	43543.74	45492.98	47455.79	49483.67	51578.34	53741.78
	4.75%	5.19%	4.74%	4.70%	4.78%	4.48%	4.31%	4.27%	4.23%	4.19%
Sales to Iso. Sys.	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	649.00
UPS Sales	35793.38	37553.30	39182.91	40956.75	42835.74	44655.98	47028.79	48992.67	51014.34	53092.78
System Losses	7803.92	8187.62	8484.86	8808.44	9212.55	9538.17	9975.80	10320.49	10671.68	11028.94
(% of Gen.)	17.90%	17.90%	17.80%	17.70%	17.70%	17.60%	17.50%	17.40%	17.30%	17.20%
Total Generation (GWh)	43597.30	45740.92	47667.78	49765.19	52048.28	54194.15	57004.59	59313.15	61686.03	64121.72
G.R %	4.68%	4.92%	4.21%	4.40%	4.59%	4.12%	5.19%	4.05%	4.00%	3.95%

Note: Low scenario assumes average annual GDP growth of 4.5% (for econometric equations) and average VHV Industrial sales growth of 0% after FY96.

Peak Demand Forecast (Low Scenario)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00
Residential										
Energy (GWh)	11591.45	12307.98	13035.08	13771.07	14514.24	15262.93	16015.52	16770.41	17526.10	18281.11
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	3863.8	4102.7	4345.0	4590.4	4838.1	5087.6	5338.5	5590.1	5842.0	6093.7
Commercial										
Energy (GWh)	1645.61	1732.62	1822.62	1910.33	2000.73	2093.83	2189.64	2288.17	2389.42	2493.40
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	391.8	412.5	434.0	454.8	476.4	498.5	521.3	544.8	568.9	593.7
VHV Sales (Industrial)										
Energy (GWH)	6770.00	6980.00	7054.00	7144.00	7294.00	7344.00	7344.00	7344.00	7344.00	7344.00
Hours Use	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000
Peak (MW)	967.1	997.1	1007.7	1020.6	1042.0	1049.1	1049.1	1049.1	1049.1	1049.1
Non VHV Industrial										
Energy (GWh)	10644.50	11232.68	11853.36	12508.34	13199.51	13928.87	14698.54	15510.73	16367.80	17272.23
Hours Use	4200	4200	4200	4200	4200	4200	4200	4200	4200	4200
Peak (MW)	2534.4	2674.4	2822.2	2978.2	3142.7	3316.4	3499.7	3693.0	3897.1	4112.4
Public Utilities										
Energy (GWh)	2545.09	2676.37	2814.42	2959.58	3112.24	3272.77	3441.58	3619.10	3805.78	4002.08
Hours Use	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Peak (MW)	424.2	446.1	469.1	493.3	518.7	545.5	573.6	603.2	634.3	667.0
Other Dist. Co. Sales										
Energy (GWh)	2828.73	2966.65	3111.43	3263.43	3423.02	3590.58	3766.51	3951.25	4145.24	4348.96
Hours Use	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Peak (MW)	942.9	988.9	1037.1	1087.8	1141.0	1196.9	1255.5	1317.1	1381.7	1449.7
Total Sales (GWh)	36025.38	37896.30	39890.91	41556.75	43543.74	45492.98	47455.79	49483.67	51578.34	53741.78
Sales to Iso. Sys.										
Energy (GWh)	232.00	343.00	508.00	600.00	708.00	837.00	427.00	491.00	564.00	649.00
Hours Use	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
Peak (MW)	63.3	98.0	145.1	171.4	202.3	239.1	122.0	140.3	161.1	185.4
Losses & Co. Use										
Energy (GWh)	7803.92	8187.62	8484.85	8808.44	9212.55	9538.17	9975.80	10320.49	10371.68	11028.94
Hours Use	6100	6100	6100	6100	6100	6100	6100	6100	6100	6100
Peak (MW)	1279.3	1342.2	1391.0	1444.0	1510.3	1563.6	1635.4	1691.9	1749.5	1808.0
Total Energy (GWh)	43597.30	45740.92	47667.78	49765.19	52043.28	54194.15	57004.59	59313.15	61683.03	64121.72
Non-Coinc. Peak (MW)	10337	10856	11361	11898	12467	13019	13751	14349	14962	15588
Coincidence Factor	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%	68.00%
Peak Load	7029	7389	7725	8090	8477	8853	9351	9757	10174	10600
	5.48%	5.11%	4.56%	4.72%	4.78%	4.43%	5.63%	4.35%	4.27%	4.19%
Load Factor	70.80%	70.67%	70.44%	70.22%	70.09%	69.88%	69.59%	69.39%	69.21%	69.06%

Econometric Equations Utilized for the Forecast

Sector	Equation
Non-VHV Industry	INDKWH = EXP (-3.474091 + 1.221896 x LN(GDP)) (-6.68) (23.95) R**2 = 0.98
Agriculture	AGKWH = EXP (-2.399712 + .9245801 x LN(GDP)) (-4.17) (16.3) R**2 = 0.97
Public Utilities	PUBKWH = EXP (-3.077873 + 1.142612 x LN(GDP)) (-4.7) (13.23) R**2 = 0.95
Commercial	COMKWH = EXP (10.39716 - 1840.929 / GDPPOP) (41.6) (-14.1) R**2 = 0.96
Residential	RESKWH = EXP (10.75089 - 47260.13 / GDP) (108.7) (-19.7) R**2 = 0.98
Government	GOVKWH = EXP (-5.616259 + 1.234607 x LN(GDP)) (-5.05) (11.3) R**2 = 0.92

APPENDIX C: INDIVIDUALS INTERVIEWED OUTSIDE EEA

EGYPTIAN GENERAL PETROLEUM CORPORATION (EGPC)

Eng. Abdel Rahman S. Abdel Naby	Deputy Chairman for Local Trades
Eng. Mohamed I. Tawila	General Manager - Gas Production
Eng. Hazem Hammad	Acting Deputy Chairman for Gas
Eng. Abdalla El Bastawisi	Gas Distribution

EEA - SHOUBRA EL KHEIMA POWER PLANT

Eng. Abd El Mageed Radwan	Project Manager
Eng. Maher R. Tadros	Technical Affairs and Computer Manager
Eng. Hussein Saber Hussein	Training Manager

EEA - DISPATCH CENTER

Dr. Kamel Yassin Aly Moustafa	General Manager - Operating Conditions & Advanced Applications

EEA - UPPER EGYPT ZONE

Eng. Mostafa Elgenaidy	President South Upper Egypt Zone
Eng. Ahmed Badawi	Director of Planning
Mme. Eng. Magda Abou Neima	Database

EEA - ASWAN I AND II POWER PLANT

Eng. Ibrahm Abdel Rahman
Eng. Badam Abufat
Eng. Badri Madbulu

EEA - HIGH DAM POWER PLANT

Eng. Ahmed El Mesallami
Eng. Soliman Yunis
Eng. Madlahn Moried

APPENDIX D: FEA'S COMMITTED PLAN THROUGH 1995 AND PROJECTIONS OF RESERVES THROUGH 2000

Appendix D
EEA's Committed Plan through 1995 and Projections of Reserves through 2000

Egypt/Tariff Study — EEA – GENERATION SYSTEM EXPANSION PLAN

Fiscal Year End	Description	Type	Status	Number of Units	Unit Capacity (MW)	Available Capacity (MW)	Nameplate Capacity (MW)	Forced Outage Rate (%)	Annual Scheduled Outage (Days)	Avail. Rate (%)	Effective Capacity (MW)	Economic Use Factor	Energy Potential (GWH)
1989	cairo west (st)	1	EXISTING	4	75.00	300.00	350.00	8.0%	30.00	0.84	253.32	100.0%	2219
	cairo south (st)	1	EXISTING	4	55.00	220.00	255.00	8.0%	30.00	0.84	185.76	100.0%	1627
	cairo north (st)	1	EXISTING	2	25.00	50.00	100.00	8.0%	30.00	0.84	42.22	100.0%	370
	el tebbin (st)	1	EXISTING	3	13.00	39.00	45.00	8.0%	30.00	0.84	32.93	100.0%	288
	new talkha (st)	1	EXISTING	3	25.00	75.00	90.00	8.0%	30.00	0.84	63.33	100.0%	555
	old talkha (st)	1	EXISTING	3	10.00	30.00	37.50	8.0%	30.00	0.84	25.33	100.0%	222
	new damanhour (st)	1	EXISTING	3	40.00	120.00	195.00	8.0%	30.00	0.84	101.33	100.0%	888
	old damanhour (st)	1	EXISTING	2	10.00	20.00	30.00	8.0%	30.00	0.84	16.89	100.0%	148
	kafr el dawar (st)	1	EXISTING	4	80.00	320.00	440.00	8.0%	30.00	0.84	270.20	100.0%	2367
	suif (st)	1	EXISTING	4	23.00	92.00	113.00	8.0%	30.00	0.84	77.68	100.0%	681
	suez (st)	1	EXISTING	4	20.00	80.00	100.00	8.0%	30.00	0.84	67.55	100.0%	592
	assiut (st)	1	EXISTING	3	24.00	72.00	90.00	8.0%	30.00	0.84	60.80	100.0%	533
	abu kir (st)	1	EXISTING	4	140.00	560.00	600.00	8.0%	30.00	0.84	472.85	100.0%	4142
	abu soltan (st)	1	EXISTING	4	140.00	560.00	600.00	8.0%	30.00	0.84	472.85	100.0%	4142
	shoubrah (st)	1	EXISTING	4	300.00	1200.00	1296.00	8.0%	30.00	0.84	1013.26	100.0%	8876
	attaka (st)	1	EXISTING	2	140.00	280.00	600.00	8.0%	30.00	0.84	236.43	100.0%	2071
	helwan (gt)	2	EXISTING	5	20.00	100.00	120.00	12.0%	14.00	0.85	84.62	20.0%	148
	el tebbin (gt)	2	EXISTING	2	20.00	40.00	46.00	12.0%	14.00	0.85	33.85	20.0%	59
	cairo east (gt)	2	EXISTING	2	18.00	36.00	46.00	12.0%	14.00	0.85	30.46	20.0%	53
	ismailia (gt)	2	EXISTING	1	16.00	16.00	20.00	12.0%	14.00	0.85	13.54	20.0%	24
	port said (gt)	2	EXISTING	2	16.00	32.00	60.00	12.0%	14.00	0.85	27.08	20.0%	47
	mahmoudia (gt)	2	EXISTING	8	20.00	160.00	200.00	12.0%	14.00	0.85	135.40	20.0%	237
	mahmoudia (gt)	2	EXISTING	4	36.00	144.00	192.00	12.0%	14.00	0.85	121.86	20.0%	213
	shabab (gt)	2	EXISTING	3	25.00	75.00	100.00	12.0%	14.00	0.85	63.47	20.0%	111
	suif (gt)	2	EXISTING	7	22.00	154.00	225.00	12.0%	14.00	0.85	130.32	20.0%	228
	damanhour (gt)	2	EXISTING	4	20.00	80.00	100.00	12.0%	14.00	0.85	67.70	20.0%	119
	wadi hof (gt)	2	EXISTING	3	27.00	81.00	100.00	12.0%	14.00	0.85	68.55	20.0%	120
	demietta (gt)	2	EXISTING	6	110.00	660.00	500.00	12.0%	14.00	0.85	558.52	20.0%	979
	cairo south (gt)	2	EXISTING	2	100.00	200.00	220.00	12.0%	14.00	0.85	169.25	20.0%	297
	cairo north (gt)	2	EXISTING			0.00	23.00	12.0%	14.00	0.85	0.00	20.0%	0
	heliopolis (gt)	2	EXISTING			0.00	37.50	12.0%	14.00	0.85	0.00	20.0%	0
	talkha (gt)	2	EXISTING			0.00	192.00	12.0%	14.00	0.85	0.00	20.0%	0
	max (gt)	2	EXISTING			0.00	28.00	12.0%	14.00	0.85	0.00	20.0%	0
	abu matamir (gt)	2	EXISTING			0.00	20.00	12.0%	14.00	0.85	0.00	20.0%	0
	karmouz (gt)	2	EXISTING			0.00	25.00	12.0%	14.00	0.85	0.00	20.0%	0
	abu kir (gt)	2	EXISTING			0.00	20.00	12.0%	14.00	0.85	0.00	20.0%	0
	suez (gt)	2	EXISTING			0.00	17.00	12.0%	14.00	0.85	0.00	20.0%	0
	faioum (gt)	2	EXISTING			0.00	20.00	12.0%	14.00	0.85	0.00	20.0%	0
	talkha (cc)	3	EXISTING	2	130.00	260.00	100.00	8.0%	28.00	0.85	220.85	100.0%	1935
	aswan+hi.dam (hy)	5	EXISTING			2159.00	2745.00	0.0%	0.00	1.00	2159.00	100.0%	9322
						8215.00					7277.21		43813.30
						6279.00					6279.00		39580.00
						23.57%					13.72%		9.25%
1990	suez (st)	1	SCHEDULED	1.00	90.00	90		12.0%	30.00	0.81	72.69	20.0%	127
	damanhour 4 (st)	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
	attaka 3 (st)	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
	cairo south 3 (st)	2	SCHEDULED	1.00	100.00	100		8.0%	30.00	0.84	84.44	20.0%	148
						8945.00					7890.31		47882.86
						6726.00					6726.00		41858.00
						24.81%					14.76%		12.58%

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Egypt/Tariff Study EEA – GENERATION SYSTEM EXPANSION PLAN

Fiscal Year End	Description	Type	Status	Number of Units	Unit Capacity (MW)	Available Capacity (MW)	Nameplate Capacity (MW)	Forced Outage Rate (%)	Annual Scheduled Outage (Days)	Avail. Rate (%)	Effective Capacity (MW)	Economic Use Factor	Energy Potential (GWH)
1991	heliopolis 4+5 (gt)	2	SCHEDULED	2.00	10.00	20		12.0%	14.00	0.85	16.92	20.0%	30
	talkha 4 (st)	1	SCHEDULED	1.00	200.00	200		8.0%	30.00	0.84	168.88	100.0%	1479
	demietta gt ret.	2	SCHEDULED	-6.00	110.00	-660		12.0%	14.00	0.85	-558.52	20.0%	-979
	demietta cc conv.	3	SCHEDULED	6.00	175.00	1050		10.0%	28.00	0.83	872.51	100.0%	7643
	abu kir 5 (st)	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						9825.00					8618.08		58053.64
						7134.00					7134.00		44397.20
						27.39%					17.22%		23.52%
1992	cairo south 3 (gt)	2	SCHEDULED	1.00	100.00	100		8.0%	30.00	0.84	84.44	20.0%	148
	assiut 4 st	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						10195.00					8930.50		60198.71
						7594.00					7594.00		47259.90
						25.51%					14.97%		21.49%
1993	damanhour st ret.	1	SCHEDULED	-2.00	10.00	-20		8.0%	30.00	0.84	-16.89	100.0%	-148
	talkha 5 st	1	SCHEDULED	1.00	200.00	200		8.0%	30.00	0.84	168.88	100.0%	1479
	cairo south gt ret.	2	SCHEDULED	-1.00	100.00	-100		12.0%	14.00	0.85	-84.62	20.0%	-148
	cairo south cc conv.	3	SCHEDULED	1.00	155.00	155		10.0%	28.00	0.83	128.80	100.0%	1123
	cairo west st 5	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						10537.00					9219.28		62728.41
						8088.00					8088.00		49737.10
						23.24%					12.27%		20.71%
1994	damanhour gt ret.	2	SCHEDULED	-4.00	20.00	-80		12.0%	14.00	0.85	-67.70	20.0%	-119
	damanhour cc conv.	3	SCHEDULED	4.00	30.00	120		10.0%	28.00	0.83	99.72	100.0%	874
	mahmoudia gt ret.	2	SCHEDULED	-8.00	20.00	-160		12.0%	14.00	0.85	-135.40	20.0%	-237
	mahmoudia cc conv.	3	SCHEDULED	8.00	30.00	240		10.0%	28.00	0.83	199.43	100.0%	1747
	cairo west st 6	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						10927.00					9543.31		66990.23
						8634.00					8634.00		53094.70
						20.93%					9.53%		20.74%
1995	assiut 5 st	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
	ayun mousa 1 cst	4	SCHEDULED	1.00	270.00	270		8.0%	42.00	0.81	219.82	100.0%	1926
	sidi krir 1 st	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						11737.00					10219.09		72910.10
						9211.00					9211.00		56643.00
						21.52%					9.86%		22.31%
1996		1	PLANNED	1.00	600.00	600		12.0%	30.00	0.81	484.60	100.0%	4245
	ayun mousa 2 cst	4	SCHEDULED	1.00	270.00	270		8.0%	42.00	0.81	219.82	100.0%	1926
	sidi krir 2 st	1	SCHEDULED	1.00	270.00	270		8.0%	30.00	0.84	227.98	100.0%	1997
						12877.00					11151.49		81077.95
						9832.00					9832.00		60461.80
						23.65%					11.83%		25.43%

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Egypt/Tariff Study

EEA – GENERATION SYSTEM EXPANSION PLAN

Fiscal Year End	Description	Type	Status	Number of Units	Unit Capacity (MW)	Available Capacity (MW)	Nameplate Capacity (MW)	Forced Outage Rate (%)	Annual Scheduled Outage (Days)	Avail. Rate (%)	Effective Capacity (MW)	Economic Use Factor	Energy Potential (GWH)
1997	ismailia gt ret.	2	SCHEDULED	-1.00	16.00	-16		12.0%	14.00	0.85	-13.54	20.0%	-24
	port said gt ret.	2	SCHEDULED	-2.00	16.00	-32		12.0%	14.00	0.85	-27.08	20.0%	-47
		1	PLANNED	2.00	600.00	1200		12.0%	30.00	0.81	969.21	100.0%	8490
						14029.00					12080.08		89497.03
						10472.00					10472.00		64397.50
						25.35%					13.31%		28.05%
1998	assiut st ret.	1	SCHEDULED	-1.00	24.00	-24		8.0%	30.00	0.84	-20.27	100.0%	-178
		2	PLANNED	1.00	110.00	110		11.0%	14.00	0.86	94.14	20.0%	165
						14115.00					12153.96		89484.45
						11176.00					11176.00		67694.80
						20.82%					8.05%		24.35%
1999	helwan gt ret.	2	SCHEDULED	-5.00	20.00	-100		12.0%	14.00	0.85	-84.62	20.0%	-148
	el tebbin gt ret.	2	SCHEDULED	-2.00	20.00	-40		12.0%	14.00	0.85	-33.85	20.0%	-59
	cairo east gt ret.	2	SCHEDULED	-2.00	18.00	-36		12.0%	14.00	0.85	-30.46	20.0%	-53
		2	PLANNED	2.00	110.00	220		11.0%	14.00	0.88	188.29	20.0%	330
		4	PLANNED	1.00	270.00	270		12.0%	42.00	0.78	210.26	100.0%	1842
		4	PLANNED	1.00	600.00	600		12.0%	42.00	0.78	467.24	100.0%	4093
						15029.00					12870.81		95488.32
						11911.00					11911.00		72146.80
						20.75%					7.46%		24.44%
2000	heliopolis gt ret.	2	SCHEDULED	-1.00	10.00	-10		12.0%	14.00	0.85	-8.46	20.0%	-15
		1	PLANNED	1.00	600.00	600		12.0%	30.00	0.81	484.60	100.0%	4245
		2	PLANNED	2.00	110.00	220		11.0%	14.00	0.83	168.29	20.0%	330
						15839.00					13535.24		100048.5
						12721.00					12721.00		76454.60
						19.69%					6.02%		23.58%

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APPENDIX E: RELATIONSHIP BETWEEN A DECLINING RATE IN FUTURE RESERVE ADDITIONS AND CUMULATIVE ADDITIONS

The mathematical model commonly used for predicting future reserve additions is given by the following equations:

$$I_o e^{-\alpha t} dt = R$$

where

R	=	ultimate total reserve addition over the period o through year t
I_o	=	reserve addition in year o
α	=	decline rate.

This equation can be simplified as follows:

$$\Phi I_o e^{-\alpha t} / (-\alpha) = R$$

or $$Io (1 - e^{-\alpha T}) = \alpha R$$

or $$e^{-\alpha T} = 1 - \alpha R$$

or $$\ln (e^{-\alpha T}) = \ln (1 - \alpha R)$$

or $$-\alpha T = \ln (1 - \alpha R)$$

To illustrate,

In the medium case,

$I_o = 1$ and $T = 50$, and R is 22.7.

APPENDIX F: PROJECTED FUEL PRICES FOR MAZOUT AND SOLLAR

This appendix presents the projections of fuel oil price used for the tariff study. The year-by-year price forecasts for mazout and sollar are shown in Exhibits F-1 and F-2, respectively.

To illustrate, consider the data in Exhibit F-1. The second column defines the World Bank's crude oil projections for the year 2000, expressed in 1985 $/bbl. These are expressed in 1991 $/bbl in column 4, using the indices defined in column 3, that are provided by the World Bank.

Next, column 6 defines the mazout price as $70/tonne in 1991. This is the spot cif price of mazout for Mediterranean delivery based upon prices reported in the *Financial Times* during our third mission to Cairo (March 28, 1991 through April 11, 1991). At these prices, the implication is that the mazout-to-crude price ratio is about 54 percent in contrast to the traditionally observed 70 percent ratio (see Exhibit F-3). This divergence at present can be explained by the world-wide refinery imbalance caused by the disabling of Kuwait's refinery capability, thereby putting pressure on the remaining capability to produce higher distillation. This imbalance is projected to improve within the next couple of years. Thus, in Exhibit F-1, the mazout prices are developed by applying the product price-to-crude price ratio in column 9 to the World Bank's crude oil projections shown in column 5. A similar reasoning is used in the case of sollar fuel price projections (Exhibit F-2).

Finally, for the purposes of the LRMC analysis described in Chapter 5, we have averaged the fuel price over the period 1993 through 1995. This yields a mazout price of $1.97/MMBtu and a solar price of $4.36/MMBtu.

Exhibit F-1
Mazout Price Forecast (1991$)

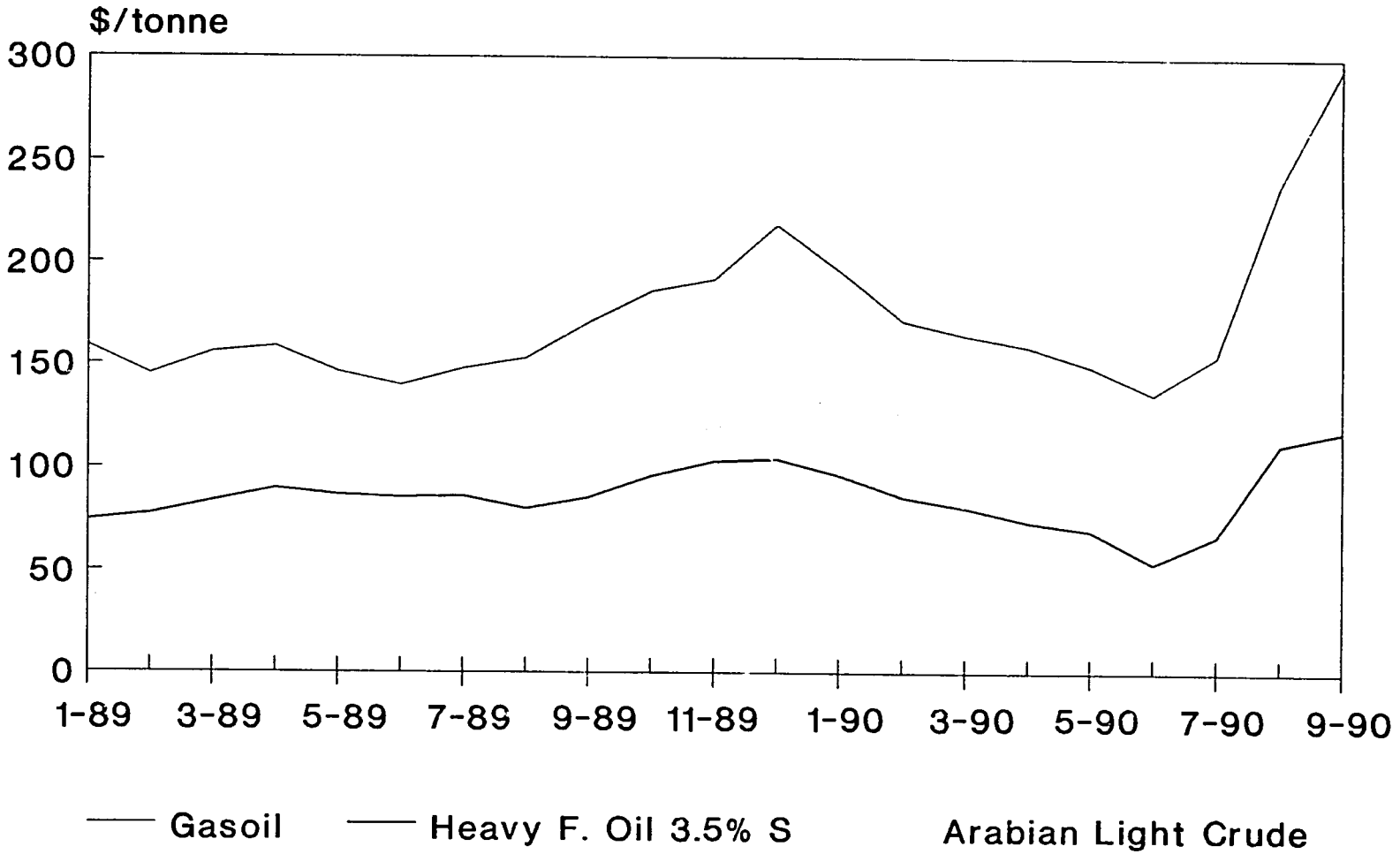
1 Year	2 Crude 1985 $/bbl	3 MUV Index 1985 = 100	4 Crude 1991 $/bbl	5 Mazout $/bbl	6 Mazout $/ tonne	7 Mazout LE/ tonne	8 Mazout $/ MMBtu	9 Mazout % Crude
1991	12.8	160.5	20.5	11.1	70.0	240.1	1.69	54%
1992	10.7	162.3	17.2	10.3	64.8	222.2	1.56	60%
1993	11.4	161.6	18.2	11.9	74.3	256.4	1.80	65%
1994	11.9	164.3	19.1	13.4	84.0	288.3	2.03	70%
1995	12.3	170.4	19.7	13.8	86.9	298.0	2.09	70%
1996	12.8	176.8	20.6	14.4	90.6	310.8	2.19	70%
1997	13.4	183.5	21.5	15.0	94.5	324.3	2.28	70%
1998	14.0	190.3	22.4	15.7	98.6	338.3	2.38	70%
1999	14.6	197.5	23.4	16.4	102.9	352.9	2.48	70%
2000	15.2	204.9	24.4	17.1	107.4	268.2	2.59	70%

Exhibit F-2
Sollar Price Forecast (1991$)

1 Year	2 Crude 1985 $/bbl	3 MUV Index 1985 = 100	4 Crude 1991 $/bbl	5 Sollar $/bbl	6 Sollar $/ tonne	7 Sollar LE/ tonne	8 Sollar $/ MMBtu	9 Sollar % Crude
1991	12.8	160.5	20.5	25.4	180.0	617.4	4.14	123%
1992	10.7	162.3	17.2	24.0	170.7	585.4	3.93	140%
1993	11.4	161.6	18.2	25.6	181.8	623.7	4.18	140%
1994	11.9	164.3	19.1	26.7	189.8	651.1	4.37	140%
1995	12.3	170.4	19.7	27.5	196.2	673.0	4.51	140%
1996	12.8	176.8	20.6	28.8	204.7	702.1	4.71	140%
1997	13.4	183.5	21.5	30.1	213.5	732.5	4.91	140%
1998	14.0	190.3	22.4	31.4	222.8	764.1	5.13	140%
1999	14.6	197.5	23.4	32.7	232.4	797.2	5.35	140%
2000	15.2	204.9	24.4	34.2	242.5	831.7	5.58	140%

Exhibit F-3

Prices of Gasoil and Heavy Fuel Oil
Compared With Crude Oil Prices



Source: *Petroleum Market Intelligence* and *Petroleum Intelligence Weekly*.

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APPENDIX G: COAL PRICE PROJECTIONS

Because Egypt does not import coal for use in electricity generation, our price projection for coal is based upon prices of steam coal imported by other countries. For planning purposes, it is reasonable to assume a price of $1.80 per MMBtu in 1989 dollars, with no escalation, for low-sulfur coal (less than 1 percent sulfur) delivered to Abu Qir, Damietta, or Suez.

THE WORLD COAL MARKET AND EGYPT'S PURCHASING OPTIONS

International trade in coal is dominated by two importing regions -- Europe and Japan -- that are served by several exporting regions -- Australia, Canada, the United States, Colombia, South Africa, Poland, the Soviet Union, and China. Australia is the world's leading coal exporter.

The cost of ocean transportation does not vary enough to restrict either Europe or Japan to purchases from a limited geographic region. A few geographic restrictions apply, however:

- Colombia and Poland sell coal to Europe but not to Japan.
- Utah coal may be exported to Japan but not to Europe.

Because Egypt is situated between Europe and Japan and has rail lines to Mediterranean and Red Sea ports, it is in a very good position to obtain competing bids and purchase coal from competing suppliers.

Italy is a major coal importer, and ENEL purchases coal from the United States, Colombia, Poland, and South Africa. Coal prices in the Italian import market are a good indicator of the price levels that would prevail in an Egyptian coal market.

Although the coal fields of the Soviet Union are near the Black Sea and therefore relatively close to Egypt, the Soviet coal industry has exhausted much of the nation's high-quality coal and is now mining coals with very high ash content. Poor working conditions have led to nationwide strikes among coal miners, and the industry faces political opposition based on environmental issues. Over the long term, Soviet coal exports may cease entirely.

On the basis of geography and price alone, it would appear that Egypt could import steam coal from South Africa. In our analysis we assume that Egypt never imports South African coal, for political reasons, despite the fact that South Africa is the only African coal exporter.

Export sales of South African coal are restricted by trade sanctions, and prices of South African coal are therefore depressed. Over the long term, it is possible that changes in the policies of the South African government will permit these sanctions to be lifted. If apartheid were ended, however, the production cost of South African coal might rise substantially. It is very difficult to tell whether South Africa could compete with Australia, Colombia and other countries in the absence of apartheid.

Neither Europe nor Japan wants to import low-quality coal, which may be defined as either high sulfur (i.e., greater than 1 percent sulfur) or high ash (i.e., greater than 10 percent ash) or both. All of the eastern European countries and some of the western European countries have suffered such severe environmental damage from the use of low-quality domestic coal that imports of low-quality coal are out of the question. The size of the market for international trade in low-quality coal may therefore become very small. If Egypt chooses to burn low-quality coal the prices may be attractive, although it may be impossible to rely upon spot market pricing to establish "fair" prices for low-quality coal. The latest issue of IEA's *Coal Information*, for example, gives spot prices for various coals with less than 1 percent sulfur, but no spot prices for high-sulfur coals. Our price projection is based upon IEA data, which focus on the types of coal purchased by IEA member countries.

THE RELATIONSHIP BETWEEN COAL PRICES AND OIL PRICES

Although coal demand is strengthened when oil prices are very high and utilities expect oil prices to remain very high, this type of coal demand situation has not prevailed since the 1970s. A short-run increase in oil prices does not stimulate investment in coal boilers because investment decisions are typically driven by long-term considerations. Coal demand is dominated by electric utilities. Even a short-run increase in coal prices associated with a jump in coal demand is likely to be wiped out in less than a decade as new mines are opened in response to higher prices.

The long-run supply curve for global coal is very flat. Several coal exporting countries have the coal resources necessary to maintain exports at current levels almost indefinitely. Coal reserve/production ratios are so large that reserve additions are practically ignored by both buyers and sellers. We therefore project flat real coal prices.

Since 1980, coal prices have exhibited no relationship to oil prices. There is no reason to expect any long-term correlation in the future.

METHODOLOGY

To identify the most likely sources of coal for Egypt, and to estimate price levels for coal unloaded at Egyptian ports, we converted costs per ton (published by IEA) to costs per million Btu and selected the least expensive coals available to the European market. We assume that Egypt will not purchase South African coal. The least-cost coals cost roughly $1.80 per MMBtu on a delivered basis (in 1989 dollars), and are supplied by the United States (specifically, Alabama and West Virginia) and Australia (see Exhibit G-1). Alabama coal is shipped by barge through the city of Mobile, and West Virginia coal is moved by rail to a port at Hampton Roads, Virginia.

The cost figures published by IEA are not intended to reflect future currency adjustments and future changes in the relative cost of coal mined in different countries. Therefore, Colombia, Poland, Canada, and China should also be considered as potential suppliers of coal for Egypt. Indonesia may also become an important exporter, although it has not been able to displace exports from Australia and China.

For a "high price" case one could assume coal prices of $2.20 per MMBtu in 1989 dollars, on the basis of the data in Exhibit G-1. Practically any coal exporter in the world can deliver coal to Egypt for $2.20 per MMBtu. We consider the $1.80 price level (in constant 1989 dollars) more likely to prevail, however, because Egypt is likely to purchase coals of somewhat lower quality than the average quality of coals currently imported by western Europe and Japan.

Should the value of the Egyptian pound fall sharply against the U.S. dollar, coal imports could become very expensive for Egypt. Reliance on an imported fuel for power generation, when domestic energy resources are available, is suitable only for a country that can expect to raise enough foreign exchange to pay for fuel imports. In the long run, coal prices expressed in Egyptian pounds per MMBtu could be driven upward by increases in the values of the currencies of the leading coal exporting countries.

For the purposes of our analysis, a constant exchange rate of 2.75 EL per U.S. dollar is assumed.

Exhibit G-1
Representative Costs of Coal from Various Sources

Cost Measure	Transvaal Surface Mine in Transvaal, South Africa	Alabama Surface Mine in Alabama, USA	Queensland Surface Mine in Queensland, Australia	W. Virginia Underground Mine in W. Virginia, USA	Kentucky Surface Mine in Kentucky, USA	Poland Underground Mine in Poland
Heat content:						
GJ/tonne	28.0	30.0	28.4	30.9	29.0	28.26
MMBtu/tonne	26.54	28.43	26.92	29.29	27.49	26.79
Btu/lb	12,038	12,897	12,210	13,284	12,468	12,150
Costs in 1989 US$/tonne						
Coal mine costs:						
Other than return on capital	8.0	32.4	11.3	21.2	27.4	25.0
Return on capital	4.0	1.1	9.2	1.5	1.7	4.5
Transportation costs:						
Rail or barge to port	8.8	3.2	9.5	19.4	12.2	15.0
Loading at port of export	2.6	1.3	3.2	2.3	1.3	3.0
Ocean transportation	9.5	10.2	12.8	7.8	10.2	6.0
Unloading in Egypt	3.0	3.0	3.0	3.0	3.0	3.0
Total Cost	35.9	51.2	49.0	55.2	55.8	56.5
FOB cost at port of loading	23.4	38.0	33.2	44.4	42.6	47.5
CIF cost at port of unloading	32.9	48.2	46.0	52.2	52.8	53.5
Terms of 1989 shipments to ENEL under long-term contracts with mines in this exporting country:						
FOB cost at port of loading	29.75	40.25		43.30		47.50
Heat content, kcal/kg	6,200					6,750
Heat content, Btu/lb		12,500		12,500		
Heat content, MMBtu/tonne	24.60	27.56		27.56		26.79

Exhibit G-1 (continued)
Representative Costs of Coal from Various Sources

Cost Measure	Br. Columbia Surface Mine in Br. Columbia Canada	Cerrejon Surface Mine in Carrejon, Columbia	N.S. Wales/U Underground Mine in New South Wales, Australia	N.S. Wales/S Surface Mine in New South Wales, Australia	Wyoming Surface Mine in Wyoming, USA
Heat content:					
GJ/tonne	28.5	29.2	29.5	29.1	20.7
MMBtu/tonne	27.01	27.68	27.91	27.58	19.62
Btu/lb	12,253	12,554	12,661	12,511	8,899
Costs in 1989 US$/tonne					
Coal mine costs:					
Other than return on capital	20.8	24.1	25.4	20.7	6.5
Return on capital	1.5	18.7	8.8	11.9	2.4
Transportation costs:					
Rail or barge to port	16.9	4.0	6.2	7.2	21.5
Loading at port of export	3.4	3.0	4.1	4.3	1.3
Ocean transportation	13.0	7.6	13.5	13.5	10.2
Unloading in Egypt	3.0	3.0	3.0	3.0	3.0
Total Cost	58.6	60.4	61.0	60.6	44.9
FOB cost at port of loading	42.6	49.8	44.5	44.1	31.7
CIF cost at port of unloading	55.6	57.4	58.0	57.6	41.9
Terms of 1989 shipments to ENEL under long-term contracts with mines in this exporting country:					
FOB cost at port of loading		37.00			
Heat content, kcal/kg					
Heat content, Btu/lb		11,800			
Heat content, MMBtu/tonne		26.01			

Exhibit G-1 (continued)
Representative Costs of Coal from Various Sources

Cost Measure	Transvaal Surface Mine in Transvaal, South Africa	Alabama Surface Mine in Alabama, USA	Queensland Surface Mine in Queensland, Australia	W. Virginia Underground Mine in W. Virginia, USA	Kentucky Surface Mine in Kentucky, USA	Poland Underground Mine in Poland
Heat content:						
GJ/tonne	28.0	30.0	28.4	30.9	29.0	28.26
MMBtu/tonne	26.54	28.43	26.92	29.29	27.49	26.79
Btu/lb	12,038	12,897	12,210	13,284	12,468	12,150
Costs in 1989 US$/MMBtu						
Coal mine costs:						
Other than return on capital	90.30	1.14	0.42	0.72	1.00	0.93
Return on capital	0.15	0.04	0.34	0.05	0.06	0.17
Transportation costs:						
Rail or barge to port	0.33	0.11	0.35	0.66	0.44	0.56
Loading at port of export	0.10	0.05	0.12	0.08	0.05	0.11
Ocean transportation	0.36	0.36	0.48	0.27	0.37	0.22
Unloading in Egypt	0.11	0.11	0.11	0.10	0.11	0.11
Total Cost	1.35	1.80	1.82	1.88	2.03	2.11
FOB cost at port of loading	0.88	1.34	1.23	1.52	1.55	1.77
CIF cost at port of unloading	1.24	1.70	1.71	1.78	1.92	2.00
Prices of 1989 shipments to ENEL under long-term contracts with mines in this exporting country:						
FOB cost at port of loading	1.21	1.46		1.57		1.77

Exhibit G-1 (continued)
Representative Costs of Coal from Various Sources

Cost Measure	Br. Columbia Surface Mine in Br. Columbia Canada	Cerrejon, Surface Mine in Cerrejon, Columbia	N.S. Wales/U Underground Mine in New South Wales, Australia	N.S.Wales/S Surface Mine in New South Wales, Australia	Wyoming Surface Mine in Wyoming, USA
Heat content:					
GJ/tonne	28.5	29.2	29.5	29.1	20.7
MMBtu/tonne	27.01	27.68	27.91	27.58	19.62
Btu/lb	12,253	12,554	12,661	12,511	8,899
Costs in 1989 US$/MMBtu					
Coal mine costs:					
Other than return on capital	0.77	0.87	0.91	0.75	0.33
Return on capital	0.06	0.68	0.32	0.43	0.12
Transportation costs:					
Rail or barge to port	0.63	0.14	0.22	0.26	1.10
Loading at port of export	0.13	0.11	0.15	0.16	0.07
Ocean transportation	0.48	0.27	0.48	0.49	0.52
Unloading in Egypt	0.11	0.11	0.11	0.11	0.15
Total Cost	2.17	2.18	2.19	2.20	2.29
FOB cost at port of loading	1.50	1.80	1.59	1.60	1.62
CIF cost at port of unloading	2.06	2.07	2.08	2.09	2.14
Prices of 1989 shipments to ENEL under long-term contracts with mines in this exporting country:					
FOB cost at port of loading		1.42			

Source: Analysis by RCG/Hagler, Bailly, Inc. of International Energy Agency data published in *Coal Information 1990*, pp. 17, 25, 27. Cost figures for Polish coal are rough estimates by RCG/Hagler, Bailly, Inc.

Exhibit G-2
Average CIF Price of Power Station Steam Coal Imported by European Countries
From Non-European Sources (Quarterly)

Year and Quarter	Prices Under Spot Contracts < 1 year, $/tonne	Prices Under Long-Term Contracts > 1 year, $/tonne	Overall Average Price, $/tonne	Prices Under Spot Contracts <1 year, $/MMBtu	Prices Under Long-Term Contracts > 1 year, $/MMBtu	Overall Average Price, $/MMBtu
1985 Q1	50.85	51.01	50.97	1.88	1.89	1.89
1985 Q2	50.97	52.70	52.33	1.89	1.95	1.94
1985 Q3	51.91	50.12	50.62	1.92	1.86	1.87
1985 Q4	52.63	52.39	52.46	1.95	1.94	1.94
1986 Q1	52.19	49.59	50.22	1.93	1.84	1.86
1986 Q2	49.26	49.39	49.36	1.82	1.83	1.83
1986 Q3	47.91	47.78	47.81	1.77	1.77	1.77
1986 Q4	44.18	46.75	45.83	1.64	1.73	1.70
1987 A1	39.88	45.19	43.22	1.48	1.67	1.60
1987 Q2	42.79	44.40	44.00	1.58	1.64	1.63
1987 Q3	39.56	44.18	42.49	1.47	1.64	1.57
1987 Q4	40.71	43.93	42.59	1.51	1.63	1.58
1988 Q1	41.89	45.10	43.83	1.55	1.67	1.62
1988 Q2	43.65	49.10	47.18	1.62	1.82	1.75
1988 Q3	43.94	49.39	47.09	1.63	1.83	1.74
1988 Q4	47.00	47.53	47.31	1.74	1.76	1.75
1989 Q1	47.58	47.79	47.93	1.76	1.77	1.78
1989 Q2	48.28	50.41	49.84	1.79	1.87	1.85
1989 Q3	48.84	51.21	50.87	1.85	1.90	1.88
1989 Q4	52.36	51.84	52.04	1.94	1.92	1.93

Source: Prices collected by the Commission of the European Countries and published by the International Energy Agency in *Coal Information 1990*, p. 18. Prices on a $/MMBtu basis were computed by RCG/Hagler, Bailly, Inc.

Exhibit G-3
Data Used to Project the Cost of Coal Imported by Egypt

1 US$ =	2.75 EL
1 Btu =	252 cal
1 cal =	4.1868 joule
1 lb =	8.45359 kg
1 GJ/tonne =	0.947800 MMBtu/tonne
1 GJ/tonne =	429.92 Btu/lb
1 MMBtu/tonne =	439.59 Btu/lb
1 MMBtu/tonne =	252 kcal/kg
1 toe =	39.689 MMBtu

For a coal price projection, assume $1.00 per MMBtu in constant 1989 dollars, for coal delivered to a site at Abu Qir, Danietta, or Suez. Prices are based upon the costs shown in Exhibit G-1 for Alabama, West Virginia, and Queensland coals delivered to Europe.

Assume the source of the coal is either the United States or Australia.

Assume the coal has a low sulfur content (less than 1 percent).

Estimated average heat content of coals imported by European countries from non-European sources, 1985-89 27.00 MMBtu

APPENDIX H:
POWER SYSTEM EXPANSION PROGRAM
GENERATION & NETWORK CAPACITY
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TOTAL EXPENDITURES IN CONSTANT 1990/91 PRICES

(LE 000)	1990/91			1991/92		
	TOTAL	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN
I-A TOTAL EEA CABLE COSTS	0	0	0	188018	20133	167885
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	188018	20133	167885
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-B TOTAL EEA LINE COSTS	67917	27404	40514	163273	61826	101447
500 KV	0	0	0	50650	16000	34650
220/132 KV	63064	25572	37491	110447	45005	65442
66/33 KV	4854	1831	3022	2176	821	1355
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-C TOTAL EEA SUBSTATION COSTS	317080	48255	268825	390232	49561	340671
500 KV	0	0	0	0	0	0
220/132 KV	201743	11101	190642	102239	25163	77075
66/33 KV	99689	31082	68608	268061	15919	252142
20/11/6.6 KV	15448	6073	9376	19933	8479	11453
BELOW 6.6 KV	0	0	0	0	0	0
I TOTAL EEA NETWORK COSTS	384997	75659	309339	741523	131520	610002
500 KV	0	0	0	50650	16000	34650
220/132 KV	264806	36673	228133	400703	90301	310402
66/33 KV	104743	32913	71830	270237	16740	253497
20/11/6.6 KV	15448	6073	9376	19933	8479	11453
BELOW 6.6 KV	0	0	0	0	0	0
II TOTAL EDA NETWORK COSTS	277286	245086	32201	597509	271761	325747
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	16625	2302	14323	314971	16670	298301
20/11/6.6 KV	129113	111235	17877	146385	118939	27446
BELOW 6.6 KV	131548	131548	0	136152	136152	0
III TOTAL REA NETWORK COSTS	121760	60340	61420	124240	60900	63340
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	24200	14440	9760	25000	15000	10000
20/11/6.6 KV	97560	45900	51660	99240	45900	53340
BELOW 6.6 KV	0	0	0	0	0	0
IV TOTAL GENERATION INVESTMENT	1773389	463253	1310136	2622963	715666	1907297
COMMITTED	1631173	415848	1215325	1982990	502341	1480649
PLANNED	142216	47405	94811	639973	213324	426649
V TOTAL UPS NETWORK INVESTMENT	784073	381084	402959	1463271	464182	999090
500 KV	0	0	0	50650	16000	34650
220/132 KV	264806	36673	228133	400703	90301	310402
66/33 KV	145568	49655	95913	610208	48410	561798
20/11/6.6 KV	242121	163208	78913	265558	173318	92240
BELOW 6.6 KV	131548	131548	0	136152	136152	0

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(LE 000)	1992/93			1993/94		
	TOTAL	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN
I-A TOTAL EEA CABLE COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-B TOTAL EEA LINE COSTS	3193	1112	2082	357588	124557	233030
500 KV	1520	480	1040	118645	27862	90783
220/132 KV	0	0	0	229068	92970	136099
66/33 KV	1674	632	1042	9874	3726	6149
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-C TOTAL EEA SUBSTATION COSTS	343698	67582	276116	373017	29836	343182
500 KV	0	0	0	0	0	0
220/132 KV	222909	21555	201354	122243	8981	113261
66/33 KV	85559	30949	54610	235106	16665	218441
20/11/6.6 KV	35229	15077	20152	15669	4189	11479
BELOW 6.6 KV	0	0	0	0	0	0
I TOTAL EEA NETWORK COSTS	346891	68693	278197	730605	154393	576212
500 KV	1520	480	1040	118645	27862	90783
220/132 KV	222909	21555	201354	351311	101951	249360
66/33 KV	87233	31581	55652	244980	20391	224589
20/11/6.6 KV	35229	15077	20152	15669	4189	11479
BELOW 6.6 KV	0	0	0	0	0	0
II TOTAL EDA NETWORK COSTS	744906	268657	476249	294405	256797	37608
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	469777	16737	453040	26020	900	25120
20/11/6.6 KV	134211	111003	23209	122536	110047	12488
BELOW 6.6 KV	140918	140918	0	145850	145850	0
III TOTAL REA NETWORK COSTS	125760	59660	66100	127680	63260	64420
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	25800	15560	10240	25800	15560	10240
20/11/6.6 KV	99960	44100	55860	101880	47700	54180
BELOW 6.6 KV	0	0	0	0	0	0
IV TOTAL GENERATION INVESTMENT	2575744	744715	1831029	1974708	667241	1307467
COMMITTED	1438015	365472	1072542	518615	181877	336738
PLANNED	1137729	379243	758486	1456092	485364	970728
V TOTAL UPS NETWORK INVESTMENT	1217557	397011	820546	1152690	474450	678240
500 KV	1520	480	1040	118645	27862	90783
220/132 KV	222909	21555	201354	351311	101951	249360
66/33 KV	582810	63877	518932	296800	36851	259949
20/11/6.6 KV	269401	170180	99221	240084	161936	78148
BELOW 6.6 KV	140918	140918	0	145850	145850	0

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(LE 000)	1994/95			1995/96		
	TOTAL	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN
I-A TOTAL EEA CABLE COSTS	47309	1903	45405	0	0	0
500 KV	47309	1903	45405	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-B TOTAL EEA LINE COSTS	43568	11871	31697	0	0	0
500 KV	16708	2501	14207	0	0	0
220/132 KV	26860	9370	17490	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-C TOTAL EEA SUBSTATION COSTS	37839	10695	27144	83913	13068	70845
500 KV	0	0	0	0	0	0
220/132 KV	14381	1796	12585	0	0	0
66/33 KV	23458	8899	14559	83913	13068	70845
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I TOTAL EEA NETWORK COSTS	128716	24470	104246	83913	13068	70845
500 KV	64016	4404	59612	0	0	0
220/132 KV	41241	11166	30075	0	0	0
66/33 KV	23458	8899	14559	83913	13068	70845
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
II TOTAL EDA NETWORK COSTS	278595	268436	10159	282964	273665	9299
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	127640	117481	10159	126725	117427	9299
BELOW 6.6 KV	150955	150955	0	156238	156238	0
III TOTAL REA NETWORK COSTS	133300	64500	68800	135240	63260	71980
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	25000	15000	10000	25800	15560	10240
20/11/6.6 KV	108300	49500	58800	109440	47700	61740
BELOW 6.6 KV	0	0	0	0	0	0
IV TOTAL GENERATION INVESTMENT	1818490	578690	1239799	1677832	534206	1143626
COMMITTED	122421	40807	81614	0	0	0
PLANNED	1696069	537883	1158185	1677832	534206	1143626
V TOTAL UPS NETWORK INVESTMENT	540611	357406	183205	502117	349993	152124
500 KV	64016	4404	59612	0	0	0
220/132 KV	41241	11166	30075	0	0	0
66/33 KV	48458	23899	24559	109713	28628	81085
20/11/6.6 KV	235940	166981	68959	236165	165127	71039
BELOW 6.6 KV	150955	150955	0	156238	156238	0

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(LE 000)	1996/97			1997/98		
	TOTAL	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN
I-A TOTAL EEA CABLE COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-B TOTAL EEA LINE COSTS	9938	3750	6188	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	9938	3750	6188	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-C TOTAL EEA SUBSTATION COSTS	54888	4456	50432	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	54888	4456	50432	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I TOTAL EEA NETWORK COSTS	64826	8206	56619	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	9938	3750	6188	0	0	0
66/33 KV	54888	4456	50432	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
II TOTAL EDA NETWORK COSTS	288788	281316	7471	395143	296237	98906
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	7531	2842	4690	95405	3300	92105
20/11/6.6 KV	119550	116768	2782	132371	125571	6800
BELOW 6.6 KV	161706	161706	0	167366	167366	0
III TOTAL REA NETWORK COSTS	135500	65500	70000	135500	65500	70000
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	29000	17800	11200	29000	17800	11200
20/11/6.6 KV	106500	47700	58800	106500	47700	58800
BELOW 6.6 KV	0	0	0	0	0	0
IV TOTAL GENERATION INVESTMENT	1078057	416699	661358	695286	231762	463524
COMMITTED	0	0	0	0	0	0
PLANNED	1078057	416699	661358	695286	231762	463524
V TOTAL UPS NETWORK INVESTMENT	489113	355022	134091	530643	361737	168906
500 KV	0	0	0	0	0	0
220/132 KV	9938	3750	6188	0	0	0
66/33 KV	91420	25098	66322	124405	21100	103305
20/11/6.6 KV	226050	164468	61582	238871	173271	65600
BELOW 6.6 KV	161706	161706	0	167366	167366	0

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(LE 000)	1998/99			1999/00		
	TOTAL	LOCAL	FOREIGN	TOTAL	LOCAL	FOREIGN
I-A TOTAL EEA CABLE COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-B TOTAL EEA LINE COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I-C TOTAL EEA SUBSTATION COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
I TOTAL EEA NETWORK COSTS	0	0	0	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	0	0	0	0	0	0
20/11/6.6 KV	0	0	0	0	0	0
BELOW 6.6 KV	0	0	0	0	0	0
II TOTAL EDA NETWORK COSTS	456049	305743	150305	0	0	0
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	151294	6552	144742	0	0	0
20/11/6.6 KV	131531	125967	5564	0	0	0
BELOW 6.6 KV	173224	173224	0	0	0	0
III TOTAL REA NETWORK COSTS	119460	66620	52840	41160	0	41160
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	30600	18920	11680	0	0	0
20/11/6.6 KV	88860	47700	41160	41160	0	41160
BELOW 6.6 KV	0	0	0	0	0	0
IV TOTAL GENERATION INVESTMENT	178236	54609	123626	0	0	0
COMMITTED	0	0	0	0	0	0
PLANNED	178236	54609	123626	0	0	0
V TOTAL UPS NETWORK INVESTMENT	575509	372363	203145	41160	0	41160
500 KV	0	0	0	0	0	0
220/132 KV	0	0	0	0	0	0
66/33 KV	181894	25472	156422	0	0	0
20/11/6.6 KV	220391	173667	46724	41160	0	41160
BELOW 6.6 KV	173224	173224	0	0	0	0

POWER SYSTEM EXPANSION PROGRAM
GENERATION & NETWORK CAPACITY
1990 INVESTMENT PROGRAM SUMMARY

TOTAL QUANTITIES IN INVESTMENT PLAN BY YEAR

	Units	FY91	FY92	FY93	FY94	FY95
I-A TOTAL EEA CABLE LENGTH	km line	0	0	26	0	0
500 KV	km line	0	0	9	0	0
220/132 KV	km line	0	0	17	0	0
66/33 KV	km line	0	0	0	0	0
20/11/6.6 KV	km line	0	0	0	0	0
BELOW 6.6 KV	km line	0	0	0	0	0
I-B TOTAL EEA LINE LENGTH	km line	161	206	503	8	1013
500 KV	km line	0	0	100	3	262
220/132 KV	km line	161	177	395	0	692
66/33 KV	km line	0	29	8	5	59
20/11/6.6 KV	km line	0	0	0	0	0
BELOW 6.6 KV	km line	0	0	0	0	0
I-C TOTAL EEA SUBSTATION CAPACITY MVA	MVA	50	540	3675	230	2400
500 KV	MVA	0	0	0	0	0
220/132 KV	MVA	0	300	2125	0	1000
66/33 KV	MVA	0	150	1500	0	1150
20/11/6.6 KV	MVA	0	90	50	230	250
BELOW 6.6 KV	MVA	50	0	0	0	0
II TOTAL EDA NETWORK LENGTH	km line	8418	9691	10302	10811	11359
500 KV	km line	0	0	0	0	0
220/132 KV	km line	0	0	0	0	0
66/33 KV (HV)	km line	0	23	112	63	3
20/11/6.6 KV						
Distrib. Switchbds	number	38	39	42	44	48
Overhead Lines	km line	1762	1850	1943	2041	2148
Underground Cable	km line	1531	1618	1710	1807	1910
Substations	MVA	0	40	375	375	125
BELOW 6.6 KV						
Distrib. Transfmrs	number	3173	3362	3565	3777	4004
Overhead Lines	km line	4057	4256	4469	4690	4924
Underground Cable	km line	1069	1944	2068	2210	2373
LV Feeders	number	4832	5122	5427	5754	6101
MV Switching Stations	number	89	99	101	110	115
III TOTAL REA NETWORK LENGTH	km line	677	680	685	690	690
500 KV	km line	0	0	0	0	0
220/132 KV	km line	0	0	0	0	0
66/33 KV						
Overhead Lines	km line	117	120	125	130	130
Underground Cable	km line	10	10	10	10	10
20/11/6.6 KV						
Substations	MVA	300	325	325	300	350
Overhead Lines	km line	300	300	300	300	300
Underground Cable	km line	250	250	250	250	250
BELOW 6.6 KV	km line	0	0	0	0	0
IV TOTAL GENERATION PLANNED/COMMITTED MW		0	300	500	615	870
STEAM	MW	0	300	500	300	600
COMBINED CYCLE	MW	0	0	0	315	0
COAL	MW	0	0	0	0	270
GAS TURBINE	MW	0	0	0	0	0

POWER SYSTEM EXPANSION PROGRAM
GENERATION & NETWORK CAPACITY
1990 INVESTMENT PROGRAM SUMMARY

TOTAL QUANTITIES IN INVESTMENT PLAN BY YEAR

	Units	FY96	FY97	FY98	FY99	FY00
I-A TOTAL EEA CABLE LENGTH	km line	2	0	0	0	0
500 KV	km line	2	0	0	0	0
220/132 KV	km line	0	0	0	0	0
66/33 KV	km line	0	0	0	0	0
20/11/6.6 KV	km line	0	0	0	0	0
BELOW 6.6 KV	km line	0	0	0	0	0
I-B TOTAL EEA LINE LENGTH	km line	141	0	25	0	0
500 KV	km line	41	0	0	0	0
220/132 KV	km line	100	0	25	0	0
66/33 KV	km line	0	0	0	0	0
20/11/6.6 KV	km line	0	0	0	0	0
BELOW 6.6 KV	km line	0	0	0	0	0
I-C TOTAL EEA SUBSTATION CAPACITY MVA	MVA	500	250	100	0	0
500 KV	MVA	0	0	0	0	0
220/132 KV	MVA	500	0	0	0	0
66/33 KV	MVA	0	250	100	0	0
20/11/6.6 KV	MVA	0	0	0	0	0
BELOW 6.6 KV	MVA	0	0	0	0	0
II TOTAL EDA NETWORK LENGTH	km line	12000	12718	13546	16378	13372
500 KV	km line	0	0	0	0	0
220/132 KV	km line	0	0	0	0	0
66/33 KV (HV)	km line	0	0	45	11	40
20/11/6.6 KV						
Distrib. Switchbds	number	50	53	56	59	63
Overhead Lines	km line	2247	2366	2485	4612	744
Underground Cable	km line	2019	2134	2256	2385	2522
Substations	MVA	75	150	50	0	100
BELOW 6.6 KV						
Distrib. Transfmrs	number	4242	4497	4764	5052	5351
Overhead Lines	km line	5171	5430	5704	5991	6295
Underground Cable	km line	2564	2789	3056	3379	3771
LV Feeders	number	6465	6854	7265	7701	8162
MV Switching Stations	number	122	130	134	146	154
III TOTAL REA NETWORK LENGTH	km line	685	690	710	710	720
500 KV	km line	0	0	0	0	0
220/132 KV	km line	0	0	0	0	0
66/33 KV						
Overhead Lines	km line	125	130	150	150	160
Underground Cable	km line	10	10	10	10	10
20/11/6.6 KV						
Substations	MVA	375	350	350	350	350
Overhead Lines	km line	300	300	300	300	300
Underground Cable	km line	250	250	250	250	250
BELOW 6.6 KV	km line	0	0	0	0	0
IV TOTAL GENERATION PLANNED/COMMITTED MW		1170	1200	110	1090	820
STEAM	MW	900	1200	0	0	600
COMBINED CYCLE	MW	0	0	0	0	0
COAL	MW	270	0	0	870	0
GAS TURBINE	MW	0	0	110	220	220

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POWER SYSTEM EXPANSION PROGRAM
GENERATION AND NETWORK CAPACITY
UNIT COST ASSUMPTIONS

NETWORK COST ASSUMPTIONS Total Cost per KM or per S/S Project (LE'000)	TOTAL	LOCAL	FOREIGN
TOTAL COST OF S/S & TRANSFORMERS			
500/220 KV SUBS. 1X500	143809	17963	125846
500/220 KV SUBS. 2X500	198211	18063	180148
500/220 KV TRANSF. 1X500	13738	100	13638
500/220 KV SUBS. 2X375	196021	4202	191819
500/220 KV TRANSF. 2X375	15828	150	15678
220/132 SUBS. 2X150	37606	2781	34825
220/66/11 SUBS. 2X125	84592	13691	70901
220/66/20 SUBS. 2X125	51547	2205	49342
220/66 KV TRANSF. 1X125	5092	80	5012
220/66 KV SUBS. 3X125	115062	7187	107875
220/66 SUBS. 2X75	72712	5337	67375
220/20 SUBS. 2X50	4264	2205	2059
220/66 SUBS. 2x125	86487	13691	72796
220/66 SUBS. 1x125	81396	13611	67785
220/66/6.3 SUBS. 3X125	115062	7187	107875
220/66/33 SUBS.2X75	11551	4336	7215
220/66 SUBS. 1X75	10513	5256	5257
220/66 TRANSF.1X75	1880	80	1800
132/33 SUBS. 2X50	75773	12733	63040
132/33 TRANSF. 2X50	2258	160	2098
132/6.3 SUBS. 2X25	9852	4963	4889
66/11 KV SUBS.GIS 2X25	15313	900	14413
66/11 KV SUBS.CONVE. 2X25	9982	3800	6182
66/20 KV SUBS.CONVE. 2X25	14127	940	13187
66/20 KV SUBS. 4X25	16103	940	15163
66/20 KV SUBS. 3X25	15075	900	14175
66/11 KV SUBS. 2X20	9982	3800	6182
66/11 KV SUBS.CONVE. 3X25	11905	5351	6554
66/11 KV TRANSF. 1X25	1389	40	1349
66/11 KV SUBS.CONVE. 4X25	12322	5358	6964
66/6.3 KV SUBS.CONVE. 2X25	10138	3830	6309
66/6.3 KV SUBS.CONVE. 4X25	12322	5358	6964
66/6.3 KV SUBS.CONVE. 4X20	12322	5358	6964
O.H.T.L. (UNIT COST PER KM)			
SINGLE CIRCUIT 500 KV ACO 3X500	507	160	347
DOUBLE CIRCUIT 500 KV ACO 3X500	832	243	589
SINGLE CIRCUIT 500 KV ACSR 1X500	408	61	347
DOUBLE CIRCUIT 220 KV ACSR 2X400	323	148	175
DOUBLE CIRCUIT 220 KV ACSR 1X400	269	94	175
DOUBLE CIRCUIT 220 & 132 KV 2x380/50	398	150	248
DOUBLE CIRCUIT 132 KV 240 mm	215	66	149
ALUMINUM 240MM 66KV	167	63	104
DOUBLE CIRCUIT 66 KV ACSR 1X385	197	79	118

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POWER SYSTEM EXPANSION PROGRAM
GENERATION AND NETWORK CAPACITY
UNIT COST ASSUMPTIONS

NETWORK COST ASSUMPTIONS (Cont'd) Total Cost per KM or per S/S Project (LE'000)	TOTAL	LOCAL	FOREIGN
CABLES (UNIT COST PER KM)			
DOUBLE CIRCUIT 1X300 XLPE	723	100	623
DOUBLE CIRCUIT 1X400 XLPE	2891	100	2791
DOUBLE CIRCUIT CU 3X400	8673	300	8373
DOUBLE CIRCUIT 1X1200 L.P.O.F	13517	544	12973
DOUBLE CIRCUIT 1X800 L.P.O.F	7801	531	7270
DOUBLE CIRCUIT 1X1267 H.P.O.F	9617	1253	8364
SINGLE CIRCUIT 500 KV 1x1000 mm	23654	952	22703

ADDITIONAL EDA NETWORK COST ASSUMPTIONS Total Cost per KM or per Unit (LE'000)	TOTAL	LOCAL	FOREIGN
20/11/6.6 KV (MV) COSTS			
DISTRIBUTION SWITCHBOARDS	12.4	12.4	0.0
OVERHEAD LINES	25.0	25.0	0.0
UNDERGROUND CABLE	60.0	60.0	0.0
BELOW 6.6 KV (LV) COSTS			
DISTRIBUTION TRANSFORMERS	19.2	19.2	0.0
OVERHEAD LINES	13.0	13.0	0.0
UNDERGROUND CABLE	35.0	35.0	0.0
LV FEEDERS	0.2	0.2	0.0
MV SWITCHING STATIONS	4.8	4.8	0.0

ADDITIONAL REA NETWORK COST ASSUMPTIONS Total Cost per KM or per S/S kVA (LE'000)	TOTAL	LOCAL	FOREIGN
TOTAL COST OF S/S PER KVA			
20/11/6.6 KV (BASED ON 2X25 KVA)	240.0	72.0	168.0
BELOW 6.6 KV (PER AVERAGE KVA)	143.9	143.9	0.0
TOTAL COST OF T&D LINE PER KM			
66/33 KV	160.0	112.0	48.0
20/11/6.6 KV	25.0	25.0	0.0
BELOW 6.6 KV	13.0	13.0	0.0
TOTAL COST OF T&D CABLE PER KM			
66/33 KV	500.0	100.0	400.0
20/11/6.6 KV	60.0	60.0	0.0
BELOW 6.6 KV	25.0	25.0	0.0

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POWER SYSTEM EXPANSION PROGRAM
GENERATION AND NETWORK CAPACITY
UNIT COST ASSUMPTIONS

GENERATION COST ASSUMPTIONS Total Cost of Committed Projects Cost per MW of Planned Projects	MW	TOTAL	LOCAL	FOREIGN
COMMITTED PROJECTS				
STEAM - TALKHA EXT/93	200	347029	56000	291029
STEAM - ASSUIT EXT/92	300	615661	23000	592661
STEAM - ASSUIT EXT/95	300	836050	90485	745565
STEAM - SIDI KIRIR/95	300	809871	269957	539914
STEAM - SIDI KIRIR/96	300	809871	269957	539914
STEAM - CAIRO WEST/93	300	809871	269957	539914
STEAM - CAIRO WEST/94	300	809871	269957	539914
C/C - CAIRO SOUTH/94	165	268300	30700	237600
C/C - DAMAN MAHM ADD/94	150	435600	105600	330000
COAL - AYUN MOUSA/95	270	828677	276226	552451
COAL - AYUN MOUSA/96	270	828677	276226	552451
PLANNED PROJECTS (W/O IDC; PER MW)				
OIL/GAS STEAM - 600 MW	1	2370	790	1580
OIL/GAS STEAM - 300 MW	1	2700	900	1800
COAL/OIL STEAM - 600 MW	1	2740	913	1827
COAL/OIL STEAM - 300 MW	1	3069	1023	2046
GAS TURBINE - 120 MW	1	982	327	655

DISBURSEMENT SCHEDULE		YEARS BEFORE COMMISSIONING				
		1	2	3	4	5
1 OIL/GAS STEAM - 600 MW	Foreign	0.10	0.25	0.30	0.25	0.10
	Local	0.10	0.25	0.30	0.25	0.10
2 OIL/GAS STEAM - 300 MW	Foreign	0.10	0.25	0.30	0.25	0.10
	Local	0.10	0.25	0.30	0.25	0.10
3 COAL/OIL STEAM - 600 MW	Foreign	0.05	0.15	0.40	0.30	0.10
	Local	0.05	0.25	0.35	0.25	0.10
4 COAL/OIL STEAM - 300 MW	Foreign	0.05	0.15	0.40	0.30	0.10
	Local	0.05	0.25	0.35	0.25	0.10
5 EXTENSION (STEAM)	Foreign	0.05	0.40	0.35	0.15	0.00
	Local	0.05	0.15	0.45	0.35	0.00
6 COMBINED CYCLE - 50/100MW	Foreign	0.20	0.20	0.60	0.00	0.00
	Local	0.10	0.20	0.70	0.00	0.00
7 ADD-ON (COMBINED CYCLE)	Foreign	0.30	0.70	0.00	0.00	0.00
	Local	0.20	0.80	0.00	0.00	0.00
8 GAS TURBINE - 120 MW	Foreign	0.20	0.80	0.00	0.00	0.00
	Local	0.10	0.90	0.00	0.00	0.00

POWER SYSTEM EXPANSION PROGRAM
GENERATION AND NETWORK CAPACITY
UNIT COST ASSUMPTIONS

NOTES ON UNIT COST ASSUMPTIONS

1. Costs developed from recent 1990/91 EEA experience. Costs exclude interest during construction.

2. Foreign costs based on actual contract price in 15 currencies. All prices converted to US$ at the official exchange rate (Wall Street Journal, European Edition, 3/28/91), and then converted to LE at the rate of LE 3.3 per US dollar. The following US$ rates were used:

BR PND	1.7385
DM	0.5841
DAN CR	0.1524
FR F	0.1723
IT LIRA	0.0008
BEL FR	0.0284
AUS SHL	0.0831
SW FR	0.6862
J YEN	0.0072
FIN MRK	0.2476
FR F	0.0143
IT LIRA	0.0001
BEL FR	0.0024
AUS SHL	0.0069
SW FR	0.0570
J YEN	0.0006
FIN MRK	0.0206

3. All network projects assumed to be disbursed in the year prior to commissioning. Generation costs assumed to be disbursed according to the schedule shown.

4. Generation costs assumed to be disbursed according to the schedule shown. For Planned generation projects, costs are assumed to be one-third local and two-thirds foreign.

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APPENDIX H: NETWORK AND GENERATION INVESTMENT PLAN

This appendix contains unit cost assumptions and a summary of the generation and network investment program for UPS. Although the investment plan is the basis for both the economic (Chapter 5) and financial (Chapter 6) analyses, there are some differences between the two analyses. These differences are noted below.

The complete investment program that appears on the following pages is divided into categories (using Roman numerals). These categories represent network investments of three entities (item I, EEA investments; item II, EDA (consolidated) investments); and item III, REA investments), and generation investments of EEA (item IV).

The *economic analysis* considers the entire UPS. It therefore incorporates all network costs on the UPS (items I through III), without regard to which entity is making them. However, the economic analysis does not include generation costs (item IV) directly; rather, the LRMC analysis is based on the cost of a single unit (either a "Peaker" or the "Next Plant" as described in Chapter 5).

The *financial analysis* incorporates the investment costs (both network and generation) of the entity being analyzed in each financial model. Thus, the EEA model includes items I and IV (both generation and network costs). The EDA model includes item II. The REA network costs are not included in any financial model because REA as an entity is not being modeled.

APPENDIX I: MODEL FOR CALCULATING SYSTEM LONG-RUN MARGINAL COSTS AND AVOIDED COSTS

EEA/UNIFIED POWER SYSTEM
BASIC PLANNING ASSUMPTIONS

Macroeconomic Assumptions:

Fiscal Year of Study	1991
Last Planning Year	2000
Planning Reserve Margin	20.0%
Discount Rate 1/	10.0%
Conversion Factors:	
Foreign 2/	1.00
Standard (SCF) 3/	0.95
Local Labor 4/	1.00
Exchange Rate (LE/US$) 5/	3.30

Assumptions for Marginal Capacity Cost Calculations:

	GENERATION: PEAKER METHOD	GENERATION: "NEXT PLANT"	TRANSMISSION & DISTRIBUTION 6/: VHV	HV	MV	LV
Marginal Plant	NEW-CT	COAL				
Life (years)	25	30	40	40	25	25
O&M and A&G (% of capital cost)	0.64%	0.88%	2.0%	2.0%	2.5%	2.5%
T&D Construction Lag (years)	-	-	1	1	1	1
Year Generation Required	1993	1993				
Capital Cost or Distribution: 7/						
Foreign (LE/KW or %)	654.9	1826.5				
Local Materials	327.5	913.3				
Local Labor (d)	0.0	0.0				

Assumptions for Marginal Energy Cost Calculations:

	PEAK	OFF-PEAK
Marginal Plant	NEW-CT	NEW-GS
Heat Rate (BTU/kWh)	14000	9800
Fuel Used	GAS/SOL	GAS/MAZ
Fuel Cost (US$/unit)	1.97	1.97
Heat Content (MMBtu/unit)	1.00	1.00
Variable O&M ($/MMBtu)	0.002	0.020

FUEL COSTS	$/MMBtu	$/Tonne	LE/Tonne
Coal	1.80	48.60	160.38
Gas/Mazout	1.97	81.74	269.75
Sollar	4.36	189.49	625.30

1/ Estimates of the opportunity cost of capital range from 6 to 10 percent.
2/ Taxes/duties excluded from cost streams; no adjustment.
3/ Based on discussion with USAID economists.
4/ Unskilled labor was not separated in the cost streams.
5/ Unless otherwise noted, all currency expressed in LE
6/ Network defined as: VHV (above 66 kv), HV (66/33 kV), MV (20/11/6.6 kV), LV (below 6.6 kV).
7/ Distributions are not used; actual estimates are available.

EEA/UNIFIED POWER SYSTEM
GRID SALES AND LOSS FORECAST

YEAR ENDING	PEAK (MW)	GROSS GEN (GWH)	LOAD FACTOR	TOTAL SALES (GWH)	------SALES BY VOLTAGE LEVEL (GWH)------					---AVERAGE LOSSES BY VOLTAGE LEVEL (GWh)---				
											Allocation of network losses (%)			
											1.3%	4.0%	4.4%	4.5%
					GEN	VHV	HV	MV	LV	STN USE	VHV	HV	MV	LV
1991	7152	44297	70.7	36368	0	6770	2448	8783	18367	1816	637	1698	1868	1910
1992	7644	47201	70.5	38752	0	6980	2615	9421	19736	1982	674	1796	1976	2021
1993	8123	49947	70.2	41056	0	7054	2793	10105	21104	2098	706	1887	2075	2123
1994	8640	52923	69.9	43556	0	7144	2983	10839	22590	2276	739	1970	2167	2216
1995	9189	56154	69.8	46214	0	7294	3187	11627	24107	2415	784	2090	2299	2351
1996	9736	59308	69.5	48869	0	7344	3404	12472	25649	2550	822	2191	2410	2465
1997	10461	63639	69.4	52502	0	7711	3637	13379	27775	2800	868	2316	2547	2605
1998	11108	67562	69.4	55806	0	8097	3886	14352	29472	2973	915	2440	2684	2745
1999	11778	71646	69.4	59251	0	8502	4152	15395	31202	3152	963	2567	2824	2888
2000	12472	75896	69.5	62842	0	8927	4437	16515	32964	3415	1004	2677	2945	3012

EEA/UNIFIED POWER SYSTEM
AVERAGE AND PEAK LOSS FACTORS (FRACTION OF INCOMING)

YEAR	--STATION USE---		------VHV-------		------HV--------		------MV--------		------LV--------	
ENDING	AVERAGE	PEAK	AVERAGE	PEAK	AVERAGE	PEAK	AVERAGE	PEAK	AVERAGE	PEAK
1991	0.041	0.041	0.015	0.019	0.048	0.061	0.060	0.076	0.094	0.119
1992	0.042	0.042	0.015	0.019	0.048	0.060	0.060	0.075	0.093	0.117
1993	0.042	0.042	0.015	0.019	0.047	0.059	0.059	0.074	0.091	0.115
1994	0.043	0.043	0.015	0.018	0.046	0.058	0.057	0.073	0.089	0.113
1995	0.043	0.043	0.015	0.019	0.046	0.058	0.057	0.072	0.089	0.113
1996	0.043	0.043	0.014	0.018	0.045	0.057	0.056	0.071	0.088	0.111
1997	0.044	0.044	0.014	0.018	0.044	0.056	0.055	0.070	0.086	0.109
1998	0.044	0.044	0.014	0.018	0.044	0.056	0.054	0.069	0.085	0.108
1999	0.044	0.044	0.014	0.018	0.043	0.055	0.054	0.069	0.085	0.108
2000	0.045	0.045	0.014	0.018	0.043	0.054	0.053	0.068	0.084	0.106
Average	0.043	0.043	0.014	0.018	0.045	0.058	0.057	0.072	0.088	0.112

5.45C EEA/UNIFIED POWER SYSTEM

DEMAND AND LOSS FORECAST AT TIME OF SYSTEM PEAK (MW)

YEAR	PEAK	STATION	GEN	VHV			HV			MV			LV	
ENDING		USE	CONSUM	LOSS	PEAK	CONSUM	LOSS	PEAK	CONSUM	LOSS	PEAK	CONSUM	LOSS	PEAK
1991	7152	293.2	0.0	129.3	6729.6	1093.1	343.3	5293.2	395.3	372.1	4525.8	1418.0	368.3	2739.4
1992	7644	321.1	0.0	137.5	7185.6	1130.4	364.9	5690.3	423.5	395.6	4871.2	1525.7	391.6	2953.9
1993	8123	341.2	0.0	145.4	7636.4	1147.2	386.0	6103.2	454.2	418.4	5230.6	1643.4	414.3	3172.9
1994	8640	371.5	0.0	152.8	8115.5	1166.3	405.5	6543.7	487.0	439.7	5617.1	1769.5	435.4	3412.2
1995	9189	395.1	0.0	162.7	8631.3	1193.6	431.9	7005.8	521.5	468.3	6016.0	1902.7	463.7	3649.6
1996	9736	418.7	0.0	171.4	9146.2	1205.6	455.1	7485.4	558.9	493.5	6433.0	2047.5	488.7	3896.8
1997	10461	460.3	0.0	181.6	9819.4	1267.6	482.1	8069.7	597.9	522.9	6949.0	2199.3	518.1	4231.6
1998	11108	488.7	0.0	191.4	10427.6	1331.2	508.0	8588.4	638.9	551.1	7398.5	2359.5	546.2	4492.8
1999	11778	518.2	0.0	201.3	11058.2	1397.6	534.5	9126.1	682.5	579.9	7863.7	2530.8	574.8	4758.2
2000	12472	561.2	0.0	209.8	11700.7	1466.9	557.1	9676.7	729.0	604.6	8343.1	2713.8	599.4	5029.8

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EEA/UNIFIED POWER SYSTEM
GENERATION CAPACITY COST - PEAKER METHOD (LE/KW)

PEAKING UNIT	-CAPACITY COST- MARKET	BORDER	WEIGHT	WEIGHTED COST AT BORDER
NEW-CT	811.86	798.33	1.00	798.33
WEIGHTED AVERAGE COST (LE/KW)				798.33

Assumptions for the Peaker Method:

Marginal Plant	NEW-CT
Life (years)	25
O&M and A&G (% of capital cost)	0.6%
Year Generation Required	1993
Capital Cost (LE/KW)	
Foreign	654.9
Local	327.5
Local Labor	0.0

EEA/UNIFIED POWER SYSTEM
RANKING OF GENERATING PLANTS BY VARIABLE COST - 1995

GENERATING PLANT GROUPS	TYPE	MEGAWATTS (MW) 1/	ANNUAL USE HRS/YR	VARIABLE COST $/KWH	VARIABLE COST LE/KWH	HEAT RATE BTU/KWH	FUEL COST $/MMBtu	VAR. O&M (% FUEL COST)	VARIABLE O&M 3/ $/KWH
BASE HYDRO 2/	B-HYD	600	-	-	-	-	-	-	-
COAL	COAL	220	7000	0.0175	0.0577	9500	1.80	2.3%	0.00039
GAS-STEAM, COMBINED CYCLE	GS-CC	5934	7000	0.0195	0.0643	9800	1.97	1.0%	0.00019
OLD GAS-STEAM	OLD-GS	1408	1600	0.0211	0.0696	10500	1.97	2.0%	0.00041
NEW COMBUSTION TURBINES	NEW-CT	349	1300	0.0276	0.0911	14000	1.97	0.1%	0.00003
OLD COMBUSTION TURBINES	OLD-CT	348	350	0.0316	0.1042	16000	1.97	0.2%	0.00006
PEAK HYDRO (3977 GWh) 2/	PK-HYD	1559	-	-	-	-	-	-	-

1/ For thermal plants, represents effective capacity.
2/ Installed hydro capacity = 2750 MW; dependable capacity = 2159 MW.
3/ Based on recent EEA experience.

YEAR ENDING	MV NETWORK ----PEAK MW----- TOTAL	DISCOUNTED	-----INVESTMENT COST------ MARKET	BORDER	DISCOUNTED	LV NETWORK ----PEAK MW----- TOTAL	DISCOUNTED	-----INVESTMENT COST------ MARKET	BORDER	DISCOUNTED
1991	0.00	0.00	242.12	233.96	233.96	0.00	0.00	131.55	124.97	124.97
1992	345.42	314.02	265.56	256.89	233.54	214.46	194.96	136.15	129.34	117.59
1993	359.38	297.01	269.40	260.89	215.61	218.99	180.99	140.92	133.87	110.64
1994	386.52	290.40	240.08	231.99	174.30	239.29	179.78	145.85	138.56	104.10
1995	398.92	272.47	235.94	227.59	155.45	237.42	162.16	150.95	143.41	97.95
1996	417.05	258.95	236.17	227.91	141.51	247.23	153.51	156.24	148.43	92.16
1997	515.96	291.25	226.05	217.83	122.96	334.79	188.98	161.71	153.62	86.72
1998	449.46	230.64	238.87	230.21	118.13	261.18	134.03	167.37	159.00	81.59
1999	465.25	217.04	220.39	211.71	98.76	265.37	123.79	173.22	164.56	76.77
2000	479.36	203.29	41.16	41.16	17.46	271.64	115.20	0.00	0.00	0.00
Lagged		2375.07 (1992-2000)			1494.22 (1991-99)		1433.41 (1992-2000)			892.48 (1991-99)
	AVERAGE INCREMENTAL MV CAPACITY COST/KW =				629.13	AVERAGE INCREMENTAL LV CAPACITY COST/KW =				622.63

5.45C EEA/UNIFIED POWER SYSTEM

GENERATION CAPACITY COST - "NEXT PLANT" METHOD (LE/KW)

"NEXT" UNIT	-CAPACITY COST- MARKET	BORDER	WEIGHT	WEIGHTED COST AT BORDER
COAL	2264.29	2226.55	1.00	2226.55
WEIGHTED AVERAGE COST (LE/KW)				2226.55

ASSOCIATED FUEL SAVINGS

---UNIT TYPE--- NEW	DISPL	COST (LE/KWH) NEW	DISPL	HRS/YR	SAVINGS/KW
COAL	GS-CC	0.0577	0.0643	7000	46.33
GS-CC	OLD-GS	0.0643	0.0696	1600	8.45
OLD-GS	NEW-CT	0.0696	0.0911	1300	27.92
NEW-CT	OLD-CT	0.0911	0.1042	350	4.59
TOTAL FUEL SAVINGS (LE/KW/YR)					87.29

Assumptions for the "Next Plant" Method:

Marginal Plant	COAL
Life (years)	30
O&M and A&G (% of capital cost)	0.9%
Year Generation Required	1993
Capital Cost (LE/KW)	
Foreign	1826.5
Local	913.3
Local Labor	0.0

EEA/UNIFIED POWER SYSTEM
NETWORK CAPACITY COSTS (LE MILLION)

YEAR	VHV COSTS				HV COSTS			
ENDING	TOTAL	FOREIGN	LOC MAT	LOC LABOR	TOTAL	FOREIGN	LOC MAT	LOC LABOR
1991	264.81	228.13	36.67	0.00	131.25	95.91	49.65	0.00
1992	451.35	345.05	106.30	0.00	610.21	561.80	48.41	0.00
1993	224.43	202.39	22.04	0.00	582.81	518.93	63.88	0.00
1994	469.96	340.14	129.81	0.00	296.80	259.95	36.85	0.00
1995	105.26	89.69	15.57	0.00	48.46	24.56	23.90	0.00
1996	0.00	0.00	0.00	0.00	109.71	81.09	28.63	0.00
1997	9.94	6.19	3.75	0.00	91.42	66.32	25.10	0.00
1998	0.00	0.00	0.00	0.00	124.41	103.31	21.10	0.00
1999	0.00	0.00	0.00	0.00	181.89	156.42	25.47	0.00
2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

YEAR ENDING	MV COSTS TOTAL	MV COSTS FOREIGN	MV COSTS LOC MAT	MV COSTS LOC LABOR	LV COSTS TOTAL	LV COSTS FOREIGN	LV COSTS LOC MAT	LV COSTS LOC LABOR
1991	242.12	78.91	163.21	0.00	131.55	0.00	131.55	0.00
1992	265.56	92.24	173.32	0.00	136.15	0.00	136.15	0.00
1993	269.40	99.22	170.18	0.00	140.92	0.00	140.92	0.00
1994	240.08	78.15	161.94	0.00	145.85	0.00	145.85	0.00
1995	235.94	68.96	166.98	0.00	150.95	0.00	150.95	0.00
1996	236.17	71.04	165.13	0.00	156.24	0.00	156.24	0.00
1997	226.05	61.58	164.47	0.00	161.71	0.00	161.71	0.00
1998	238.87	65.60	173.27	0.00	167.37	0.00	167.37	0.00
1999	220.39	46.72	173.67	0.00	173.22	0.00	173.22	0.00
2000	41.16	41.16	0.00	0.00	0.00	0.00	0.00	0.00

EEA/UNIFIED POWER SYSTEM

AVERAGE INCREMENTAL NETWORK CAPACITY COSTS BY VOLTAGE LEVEL (LE MILLION)

YEAR ENDING	VHV NETWORK ----PEAK MW----- TOTAL	DISCOUNTED	-----INVESTMENT COST------ MARKET	BORDER	DISCOUNTED	HV NETWORK ----PEAK MW----- TOTAL	DISCOUNTED	-----INVESTMENT COST------ MARKET	BORDER	DISCOUNTED
1991	0.00	0.00	264.81	262.97	262.97	0.00	0.00	145.57	143.09	143.09
1992	456.09	414.62	451.35	446.04	405.49	397.09	360.99	610.21	607.79	552.53
1993	450.75	372.52	224.43	223.33	184.57	412.93	341.26	582.81	579.62	479.02
1994	479.08	359.94	469.96	463.47	348.21	440.53	330.98	296.80	294.96	221.61
1995	515.82	352.31	105.26	104.48	71.36	462.04	315.58	48.46	47.26	32.28
1996	514.88	319.70	0.00	0.00	0.00	479.65	297.82	109.71	108.28	67.23
1997	673.23	380.02	9.94	9.75	5.50	584.30	329.82	91.42	90.16	50.90
1998	608.19	312.10	0.00	0.00	0.00	518.67	266.16	124.41	123.35	63.30
1999	630.59	294.17	0.00	0.00	0.00	537.72	250.85	181.89	180.62	84.26
2000	642.52	272.49	0.00	0.00	0.00	550.56	233.49	0.00	0.00	0.00
Lagged Total		3077.88 (1992-2000)			1278.10 (1991-99)		2726.95 (1992-2000)			1694.22 (1991-99)
AVERAGE INCREMENTAL VHV CAPACITY COST/K					415.25	AVERAGE INCREMENTAL HV CAPACITY COST/K				621.29

EEA/UNIFIED POWER SYSTEM
SUMMARY OF CAPACITY COSTS

GENERATION:	PEAKER METHOD	"NEXT PLANT"
CAPITAL COST (LE/KW)	1053.84	2939.16
(adjusted to local prices and for reserve margin and station losses at peak)		
CAPITAL COST PER YEAR (LE/KW/YR)	116.10	311.78
ASSOCIATED FUEL SAVINGS (LE/KW/YR)	-	96.03
(adjusted to local prices and for station losses)		
CAPITAL COST NET OF FUEL SAVINGS (LE/KW/YR)	116.10	215.76
O&M COST PER YEAR (LE/KW/YR)	6.74	25.86
TOTAL CAPITAL COST PER YEAR (LE/KW/YR)	122.84	241.62
CAPACITY COST PER MONTH	10.24	20.14

TRANSMISSION & DISTRIBUTION:	VHV	HV	MV	LV
CAPITAL COST (LE/KW)	437.11	653.98	662.24	655.40
(adjusted to local prices)				
CAPITAL COST PER YEAR (LE/KW/YR)	44.70	66.88	72.96	72.20
O&M COST PER YEAR (LE/KW/YR)	8.74	13.08	16.56	16.38
TOTAL CAPITAL COST PER YEAR (LE/KW/YR)	53.44	79.96	89.51	88.59
CAPACITY COST PER MONTH	4.45	6.66	7.46	7.38

EEA/UNIFIED POWER SYSTEM
STRICT LONG RUN MARGINAL COST BASED TARIFF BY VOLTAGE LEVEL

MARGINAL CAPACITY COST (LE/COINCIDENT KW/MONTH):

	---------GENERATION---------		-------TRANSMISSION & DISTRIBUTION-------					TOTAL MARGINAL CAPACITY COST	
	PEAKER METHOD	"NEXT PLANT"	VHV	HV	MV	LV	TOTAL	PEAKER METHOD	"NEXT PLANT"
VHV	10.43	20.51	4.45				4.45	14.88	24.96
HV	11.07	21.77	4.73	6.66			11.39	22.45	33.15
MV	11.92	23.45	5.09	7.18	7.46		19.73	31.65	43.17
LV	13.42	26.40	5.73	8.08	8.40	7.38	29.60	43.02	56.00

MARGINAL ENERGY COST (LE/KWH): 1/

	PEAK	OFF-PEAK
GEN	0.1002	0.0708
(adjusted to local prices and for station losses)		
VHV	0.1021	0.0718
HV	0.1083	0.0752
MV	0.1167	0.0798
LV	0.1314	0.0875

1/ Energy Costs derived directly from basic assumptions regarding marginal plant, heat rate, fuel cost, fuel heat content, and variable O&M.

EEA/UNIFIED POWER SYSTEM
STRICT LONG RUN MARGINAL COST BASED TARIFF BY TARIFF CLASS - BULK

TARIFF CLASS	SERVICE VOLTAGE	COINCI-DENCE	LOAD FACTOR	ENERGY SHARES PEAK	TOTAL MARGINAL COST/MONTH CAPACITY LE/KW	ENERGY LE/KWH	TOTAL LE/KWH	DEMAND CHARGE SHARE	FY91/H1 SALES GWH	CURRENT YIELD LE/KWH
VHV INDUSTRY										
KIMA CO.	VHV	1.00	0.90	0.21	14.38	0.0782	0.1008	22%	824	0.0170
ALUMINUM CO.	VHV	0.96	0.90	0.20	14.29	0.0779	0.0996	22%	1485	0.0460
ASSUIT CEM (1)	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	86	0.0632
ASSUIT CEM (2)	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	59	0.0632
FERROSILICON	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	153	0.0577
SOMED CO.	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	162	0.0632
DEKHILA FERRO	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	449	0.0632
AMERIA SPIN	VHV	0.95	0.90	0.20	14.14	0.0779	0.0994	22%	53	0.0632
HV INDUSTRY/AGRI	HV	0.95	0.70	0.20	21.33	0.0819	0.1236	34%	1218	0.0807
MV INDUSTRY/AGRI	MV	0.95	0.60	0.22	30.07	0.0879	0.1565	44%	126	0.1355
DISTRIBUTION COS.										
CAIRO	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	6449	0.0667
ALEXANDRIA	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1619	0.0630
DELTA NORTH	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1099	0.0514
DELTA SOUTH	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1158	0.0542
BEHEIRA	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	716	0.0647
CANAL	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1548	0.0644
N. UPPER EGYPT	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1008	0.0488
S. UPPER EGYPT	HV	1.00	0.75	0.26	22.45	0.0838	0.1249	33%	1018	0.0643
EEA SYSTEM AVERAGE				0.25	21.06	0.0827	0.1207		19229	0.0608
Equivalent LE/KWH					0.0380	0.0827	0.1207			
% of System Average					31%	69%	100%			

EEA/UNIFIED POWER SYSTEM
STRICT LONG RUN MARGINAL COST BASED TARIFF BY TARIFF CLASS - RETAIL

TARIFF CLASS	SERVICE VOLTAGE	COINCI-DENCE	LOAD FACTOR	ENERGY SHARES PEAK	TOTAL MARGINAL COST/MONTH CAPACITY LE/KW	ENERGY LE/KWH	TOTAL LE/KWH	DEMAND CHARGE SHARE	FY91/H1 SALES GWH	CURRENT YIELD LE/KWH
HOUSING COS.	HV	0.95	0.75	0.26	21.33	0.0838	0.1228	32%	350	0.0600
MV MOVING POWER	MV	0.95	0.60	0.22	30.07	0.0879	0.1565	44%	3891	0.1416
LV MOVING POWER	LV	0.95	0.55	0.25	40.87	0.0985	0.2003	51%	833	0.0979
LV OTHER PURPOSE	LV	0.95	0.55	0.25	40.87	0.0985	0.2003	51%	734	0.1353
MV FREE ZONE	MV	0.95	0.60	0.22	30.07	0.0879	0.1565	44%	6	0.1264
LV FREE ZONE	LV	0.95	0.55	0.25	40.87	0.0985	0.2003	51%	6	0.1843
RESIDENTIAL	LV	0.95	0.50	0.30	40.87	0.1007	0.2126	53%	5602	0.0421
COMMERCIAL	LV	0.95	0.45	0.30	40.87	0.1007	0.2251	55%	885	0.1083
GOVT LIGHTING	LV	0.95	0.45	0.15	40.87	0.0941	0.2185	57%	286	0.1855
STREET LIGHTING	LV	1.00	0.50	0.27	43.02	0.0993	0.2172	54%	589	0.1855
DISTRIBUTION COMPANY AVERAGE				0.26	37.25	0.0960	0.1934		13183	0.0947
Equivalent LE/KWH					0.0974	0.0960	0.1934			
% of System Average					50%	50%	100%			

EEA/UNIFIED POWER SYSTEM
STRICT LRMC SUMMARY BY CONSUMER GROUP

TARIFF CLASS	SERVICE VOLTAGE	FY91/H1 SALES GWH	CURRENT YIELD LE/KWH	CAPACITY COST/MONTH---- GEN LE/KW	NETWORK LE/KW	CAPACITY LE/KW	ENERGY COST LE/KWH	STRICT LRMC LE/KWH
VHV INDUSTRY								
KIMA CO.	VHV	824	0.0170	10.43	4.45	14.88	0.0782	0.1008
ALUMINUM CO.	VHV	1485	0.0460	10.01	4.28	14.29	0.0779	0.0996
ASSUIT CEM (1)	VHV	86	0.0632	9.91	4.23	14.14	0.0779	0.0994
ASSUIT CEM (2)	VHV	59	0.0632	9.91	4.23	14.14	0.0779	0.0994
FERROSILICON	VHV	153	0.0577	9.91	4.23	14.14	0.0779	0.0994
SOMED CO.	VHV	162	0.0632	9.91	4.23	14.14	0.0779	0.0994
DEKHILA FERRO	VHV	449	0.0632	9.91	4.23	14.14	0.0779	0.0994
AMERIA SPIN	VHV	53	0.0632	9.91	4.23	14.14	0.0779	0.0994
HV INDUSTRY/AGRI	HV	1218	0.0807	10.51	10.82	21.33	0.0819	0.1236
MV INDUSTRY/AGRI	MV	126	0.1355	11.32	18.74	30.07	0.0879	0.1565
HOUSING COS.	HV	350	0.0600	10.51	10.82	21.33	0.0838	0.1228
MV MOVING POWER	MV	3891	0.1416	11.32	18.74	30.07	0.0879	0.1565
LV MOVING POWER	LV	833	0.0979	12.75	28.12	40.87	0.0985	0.2003
LV OTHER PURPOSE	LV	734	0.1353	12.75	28.12	40.87	0.0985	0.2003
MV FREE ZONE	MV	6	0.1264	11.32	18.74	30.07	0.0879	0.1565
LV FREE ZONE	LV	6	0.1843	12.75	28.12	40.87	0.0985	0.2003
RESIDENTIAL	LV	5602	0.0421	12.75	28.12	40.87	0.1007	0.2126
COMMERCIAL	LV	885	0.1083	12.75	28.12	40.87	0.1007	0.2251
GOVT LIGHTING	LV	286	0.1855	12.75	28.12	40.87	0.0941	0.2185
STREET LIGHTING	LV	589	0.1855	13.42	29.60	43.02	0.0993	0.2172
SYSTEM AVERAGE		17797	0.0846	11.76	20.15	31.91	0.0916	0.1711
Equivalent LE/KWH				0.0293	0.0502	0.0795	0.0916	0.1711
% of System Average				17%	29%		54%	100%

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS - BULK

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1615
AVERAGE (LE/KWH) 1/	0.0840

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHNG
VHV INDUSTRY	3271	0.0435	0.0999	0.0695	60%	0.0695	60%
HV INDUSTRY/AGRI	1218	0.0807	0.1236	0.0860	7%	0.1236	53%
MV INDUSTRY/AGRI	126	0.1355	0.1565	0.1089	-20%	0.1565	16%
DISTRIBUTION COS	14615	0.0624	0.1249	0.0869	39%	0.0833	33%
TOTAL EEA BULK	19229	0.0608	0.1207	0.0840	38%	0.0840	38%

1/ Approximate revenue requirement for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 0.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS - RETAIL

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1780
AVERAGE (LE/KWH) 1/	0.1350

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	REVENUE NEUTRAL STRICT LRMC % CHNG	REVENUE RESPONSIBILITY LE/KWH	REVENUE RESPONSIBILITY % CHNG
LARGE IND/AG/COM	4522	0.1369	0.1661	0.1160	-15%	0.1661	21%
MED. IND/AG/COM	1054	0.1241	0.2057	0.1436	16%	0.2057	66%
SMALL IND/AG/COM	1054	0.1241	0.2057	0.1436	16%	0.2057	66%
FREE ZONE - MV	6	0.1264	0.1565	0.1093	-14%	0.1661	31%
FREE ZONE - LV	6	0.1843	0.2003	0.1398	-24%	0.2057	12%
RESIDENTIAL	5602	0.0421	0.2126	0.1485	253%	0.0770	83%
STREET LIGHTING	589	0.1855	0.2172	0.1517	-18%	0.2172	17%
SALE FOR RESALE	350	0.0600	0.1228	0.0857	43%	0.0963	60%
TOTAL DC RETAIL	13183	0.0947	0.1934	0.1350	43%	0.1350	43%

1/ Approximate revenue requirement for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 0.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS - SYSTEM AVERAGE

BILLING YEAR	FY93
TOTAL FINAL SALES (GWH)	17797
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	2125
AVERAGE (LE/KWH) 1/	0.1194

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHNG
VHV INDUSTRY	3271	0.0435	0.0999	0.0695	60%	0.0695	60%
HV INDUSTRY/AGRI	1218	0.0807	0.1236	0.0860	7%	0.1236	53%
MV INDUSTRY/AGRI	126	0.1355	0.1565	0.1089	-20%	0.1565	16%
LARGE IND/AG/COM	4522	0.1369	0.1661	0.1160	-15%	0.1661	21%
MED. IND/AG/COM	1054	0.1241	0.2057	0.1436	16%	0.2057	66%
SMALL IND/AG/COM	1054	0.1241	0.2057	0.1436	16%	0.2057	66%
FREE ZONE - MV	6	0.1264	0.1565	0.1093	-14%	0.1661	31%
FREE ZONE - LV	6	0.1843	0.2003	0.1398	-24%	0.2057	12%
RESIDENTIAL	5602	0.0421	0.2126	0.1485	253%	0.0770	83%
STREET LIGHTING	589	0.1855	0.2172	0.1517	-18%	0.2172	17%
SALE FOR RESALE	350	0.0600	0.1228	0.0857	43%	0.0963	60%
TOTAL SYSTEM	17797	0.0846	0.1711	0.1194	41%	0.1223	45%

1/ Approximate revenue requirement for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 0.00% increase.

APPENDIX I2: CUSTOMER CLASS LOAD PATTERNS

In the course of the last several years, EEA has conducted some load monitoring activities. Individual customer load monitoring -- for a small sample of large non-residential customers -- and feeder monitoring for predominantly residential feeders has yielded hourly load data. This appendix summarizes selected load characteristics of relevance to this study, based upon a review of the load profile printouts made available to the team.

Table 1 summarizes, by customer group, the essential characteristics of the non-residential load research sample reviewed. Table 2 summarizes the analysis of feeder loads, differentiated by "low," "medium," and "high" usage customers. Finally, Table 3 summarizes the residential load factor analysis, first by usage level segment, and finally for the residential class.

As noted in the main text, these data were considered in arriving at the assumptions made in Exhibit 5-15 in the LRMC analysis and elsewhere in the body of the report; however, given the small sample sizes in most instances as well as the fact that the sample was not selected on a random sample (or a defined probability sample) basis, these data cannot be extrapolated to the corresponding sub-populations on a statistically valid or measurable basis. However, these data did provide useful insights to the study team in developing the study assumptions.

Table 1
Load Characteristics for Selected Customer Groups

Customer Group	Number of Customers	Peak Energy (%)*	Weekly Load Factor	Ratio of Off-Peak kW to Peak kW (%)	Power Factor (%)	Seasonality	Remarks
Metallic	6	16.4	50.6	1.16	--	Minimal	
Mining	1	16.1	84.6	1.10	--	Minimal	
Chemical	2	17.2	80.0	1.03	--	Variable	
Engineering	2	17.1	57.7	1.19	66.5	Variable	
Large Shop	1	21.0	30.8	1.00	72.8	None	
Hotel	1	12.1	63.0	1.28	81.2	None	
Engineering/Industrial	3	14.0	54.9	1.32	66.8	None	
Irrigation	3	16.5	60.4	1.15	96.7	--	Only one month of data
Cement	3	16.7	78.8	1.06	82.1	Minimal	
Water - Public Utilities	2	17.0	71.4	1.20	--	--	January load much higher than other months
Petroleum	2	17.4	79.3	1.00	80.3	Variable	
Textile	3	17.7	77.4	1.04	72.1	Variable	January load much higher than other months
HV Companies	8	15.7	77.8	1.05	87.1	--	8 different customers, each with one week of data from different times

* Based on 4-hour peak period.

Table 2
"Residential Percent of kWh On-Peak" Analysis
Based on Four Months of Data

	Low Usage			Medium Usage		
	kWh	% On Peak	On-Peak kWh	kWh	% On Peak	On-Peak kWh
1989						
April	26,141	28.2	7,372	85,579	23.8	20,368
August	19,511	24.1	4,702	104,304	20.8	21,695
November	16,427	28.7	4,715	88,050	21.8	19,195
1990						
January	16,430	27.4	4,502	101,093	23.8	24,060
	78,509	**27.1**	21,291	379,026	**22.5**	85,318

	High Usage		
	kWh	% On-Peak	On-Peak kWh
1987			
July	13,713	19.6	2,688
August	15,737	20.2	3,179
September	14,318	20.9	2,992
October	11,724	21.2	2,485
	55,492	**20.4**	11,344

kWh Block	Annual Million kWh in Block	% On-Peak	On-Peak kWh
0-100	2,656	27.1	720
100-300	6,325	22.5	1,423
> 300	1,854	20.4	378
Total	10,835	**23.3***	2,521

* Estimated annual % kWh on-peak with 4-hour peak period = 23.3%

Table 3
Residential Load Factor Analysis

	Low Usage				Medium Usage				High Usage			
	kWh	Max. kW	# Hr.	% LF	kWh	Max. kW	# Hr.	% LF	kWh	Max. kW	# Hr.	% LF
1989												
April	26,141	84	720	43.2	85,579	201	720	59.1	13,713	45	744	41.0
August	19,511	48	744	54.6	104,304	216	744	64.9	15,737	50	744	42.3
November	16,427	48	720	47.5	88,050	201	720	60.8	14,318	45	720	43.6
1990												
January	16,430	43	744	51.4	101,093	220	744	61.8	11,724	35	696	48.1
	78,509	223	723	**48.1**	379,026	838	732	**61.8**	55,492	175	726	**43.7**

kWh Block	Annual Usage of Bills in Block				Annual Customers		Average Usage	
	%	Million kWh	% Mo. LF	Million kWh	%	Customers	Annual	Mo.
0-100	24.513	2,656	48.1	.630	66.215	6,008,533	436	36
101-300	58.373	6,325	61.8	1.168	31.112	2,860,778	2211	184
>300	17.114	1,854	43.7	.484	2.673	245,785	7543	629
Total	100.000	10,835	**54.2***	2.282	100.000	9,195,096		

* Estimated monthly load factor for total residential class.

APPENDIX J: SELF-FINANCING RATIO

Definition of Self-Financing Ratio

The key financial criterion adopted for the tariff study is the achievement of the self-financing ratio specified in Schedule 6 of the Loan Agreement for the Fourth Power Project between the World Bank and EEA:

1. (EEA shall) (a) produce funds from internal sources equivalent to not less than 20% for fiscal year 1991/92, 30% for fiscal year 1992/93 and 35% for each of the following fiscal years of the annual average of the Borrower's capital expenditures incurred (or expected to be incurred) during such year, the preceding fiscal year and the following fiscal year

3. For the purposes of paragraph 1 above:

   (1) The term "funds from internal sources" means the difference between:

   (A) the sum of operating expenses from all sources related to operations, consumer deposits and consumer contribution in aid of construction and net non-operating income; and

   (B) the sum of revenues from all sources related to operations including administration, adequate maintenance and taxes and payments in lieu of taxes (excluding provision for depreciation and other non-cash operating charges), debt services requirements, changes in working capital, all cash dividends and other cash distributions of surplus and other cash outflows other than capital expenditures.

   (ii) the term "net non-operating income" means the difference between:

   (A) revenues from all sources other than those related to operations; and

   (B) expenses, including taxes and payments in lieu of taxes, incurred in the generation of revenues in (A) above.

(iii) The term "debt services requirements" means the aggregate amount of repayment (including sinking fund payments, if any) of, and interest and other charges on, debt.

(iv) The term "capital expenditure" means all expenditures incurred on account of fixed assets, including interest charged to construction related to operation.

(v) Whenever for the purposes of this Section it shall be necessary to value, in terms of the currency of the Guarantor, debt payable in another currency, such valuation shall be made on the basis of the prevailing lawful rate of exchange at which such other currency is, at the time of such valuation, obtainable by the Borrower for the purposes of servicing such debt, or, in the absence of such rate, on the basis of a rate of exchange acceptable to the Guarantor and the Bank.

(vi) The term "debt" means any indebtedness of the Borrower or any EDC maturing by its term more than one year after the date on which it is originally incurred.

Case EEA-2WB (Exhibit J-1) represents, at 1991 price levels, the average EEA tariff required (see line 6) to achieve the self-financing ratio defined above by the World Bank (see line 22).

It will be seen that the resulting tariff is lower in 1993 (at 86.0 cents/KWh) than it is in 1992 (at 93.5 cents), even though the required self-financing ratio has been increased from 20.2 percent in 1992 to 30.5 percent in 1993. Even greater volatility would be seen in the inflationary case.

The reason for this volatility is that the World Bank definition (in paragraph 3(i)(B) above) includes the term "changes in working capital." Other commonly encountered definitions of the self-financing ratio omit this item.

In Exhibit J-2, which is case EEA-2RC, the results of defining the self-financing ratio to exclude "changes in working capital" are shown. Line 6 indicates that a much less volatile tariff results; in the longer term (e.g., 1995), the two definitions will tend to result in a similar level of tariffs.

Exhibit J-1

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED TRENDS AND RATIOS
(At Base Year Prices)

	--------Actual--------					Est.	----------Forecast----------				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)-Annual Growth -%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)-Annual Growth -%	50.21%	132.07%	-2.12%	47.74%	6.33%	9.56%
5											
6	16.4	22.0	24.0	30.5	Average Tariff --EL mills/kwh	43.1	93.5	86.0	119.5	119.5	123.5
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales - %	32.2%	22.7%	39.0%	42.2%	54.3%	54.7%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales - %	34.5%	61.9%	43.4%	44.5%	31.5%	30.8%
12					Operating Income to Gross Assets						
13					in Service (Average) - %:						
14	2.5%	4.3%	3.0%	4.1%	-historical	7.0%	24.8%	14.4%	18.2%	11.4%	10.6%
15					-revalued	7.0%	24.8%	14.4%	18.2%	11.4%	10.6%
16					Net Income to Equity - %:						
17	2.3%	1.2%	2.1%	1.5%	-historical	6.3%	59.8%	22.3%	29.1%	14.4%	12.6%
18					-revalued	6.3%	59.8%	22.3%	29.1%	14.4%	12.6%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	-21.0%	Self-Financing Ratio (WB)- %	-16.0%	20.2%	30.5%	34.8%	35.0%	34.9%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.44	1.44	1.06	1.55	1.26	1.38
		0.3%	-7.8%	-11.2%	Self-Financing Ratio (RCG)- %	-13.8%	52.9%	26.9%	61.4%	42.5%	49.5%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.S	0.5	0.7	0.7	0.7
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales - months	-10.0	-5.7	-6.4	-4.9	-0.5	-4.8
29	136	151	168	167	Accts.Receivable to Sales -days	160	160	150	150	150	150
30					Debt to Equity Ratio - %						
31	244.8%	457.2%	526.4%	334.2%	-historical	469.2%	259.7%	216.8%	168.4%	148.1%	131.3%
32					-revalued	469.2%	259.7%	216.8%	168.4%	148.1%	131.3%

Exhibit J-2

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED TRENDS AND RATIOS
(At Base Year Prices)

	--------Actual--------					Est.	----------Forecast----------				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)-Annual Growth -%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)-Annual Growth -%	50.21%	74.98%	36.61%	24.53%	19.88%	7.79%
5											
6	16.4	22.0	24.0	30.5	Average Tariff --EL mills/kwh	43.1	70.5	90.5	106.0	119.5	121.5
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales - %	32.2%	30.1%	37.1%	47.6%	54.3%	55.6%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales - %	34.5%	49.5%	46.2%	37.4%	31.5%	29.7%
12					Operating Income to Gross Assets						
13					in Service (Average) - %:						
14	2.5%	4.3%	3.0%	4.1%	-historical	7.0%	15.3%	16.4%	13.7%	11.5%	10.0%
15					-revalued	7.0%	15.3%	16.4%	13.7%	11.5%	10.0%
16					Net Income to Equity - %:						
17	2.3%	1.2%	2.1%	1.5%	-historical	6.3%	32.7%	30.6%	21.7%	15.4%	11.6%
18					-revalued	6.3%	32.7%	30.6%	21.7%	15.4%	11.6%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	-21.0%	Self-Financing Ratio (WB)- %	-16.0%	1.2%	18.7%	20.3%	17.7%	22.0%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.40	0.83	1.04	1.08	1.13	1.18
		0.3%	-7.8%	-11.2%	Self-Financing Ratio (RCG)- %	-13.8%	19.9%	30.3%	35.1%	35.4%	34.7%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.4	0.4	0.5	0.5	0.5
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales - months	-10.0	-9.9	-8.9	-8.9	-8.6	-8.8
29	136	151	168	167	Accts.Receivable to Sales -days	160	160	150	150	150	150
30					Debt to Equity Ratio - %						
31	244.8%	457.2%	526.4%	334.2%	-historical	469.2%	341.1%	257.6%	213.8%	185.0%	164.9%
32					-revalued	469.2%	341.1%	257.6%	213.8%	185.0%	164.9%

Therefore, although the latter definition (which is referred to, for convenience, as "RCG" definition) is less conservative than the World Bank definition, it has been adopted as being more valid and more useful for this study.

APPENDIX K: CASE EEA-Y210: BASE CASE WITH INFLATION

case # EEAY210

EGYPTIAN ELECTRICITY AUTHORITY

INPUT ASSUMPTIONS

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1	1.350	2.310	2.599	2.750	Exchange Rate -- L.E./US$	3.300	4.310	4.940	5.350	5.560	5.650
2				3.70%	Inflation Rate -- International %	8.70%	6.20%	2.20%	1.70%	2.50%	3.10%
3				15.00%	-- Egyptian %	20.00%	20.00%	15.00%	9.00%	6.00%	5.00%
4			0.8868	0.9200	Inflation Index -- International	1.0000	1.0620	1.0854	1.1038	1.1314	1.1665
5			0.7246	0.8333	Inflation Index -- Egyptian	1.0000	1.2000	1.3800	1.5042	1.5945	1.6742
6	4.00%	4.31%	4.53%	4.08%	Station Losses -- %	4.10%	4.10%	4.10%	4.10%	4.10%	4.10%
7	7.64%	7.72%	7.16%	6.31%	System Losses -- %	6.16%	5.86%	5.33%	5.00%	4.80%	4.44%
8					International Fuel Prices ($/MBTU) --						
9			4.69	4.69	-- Distillate	4.14	3.93	4.18	4.37	4.51	4.71
10			2.43	2.43	-- Residual	1.69	1.56	1.80	2.03	2.09	2.18
11			2.43	2.43	-- Natural Gas	1.69	1.56	1.80	2.03	2.09	2.18
12			1.80	1.80	-- Coal	1.80	1.80	1.80	1.80	1.80	1.80
13					* IF INFLATION IS TO BE PUT INTO *	******* *					
14					* FORECAST, INSERT "1" HERE >>>>>>	1	<<<<<< OTHERWISE, SET AT "0"				
15						******* *					
16					Interest Rate on New FX Loans -%	7.00%	*******	*******	*******	*******	*******
17					Interest Rate on New EL Loans -%	11.25%	*******	*******	*******	*******	*******
18	5.0%	3.3%	3.7%	3.5%	Depreciation Expense Rate %	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
19	136	151	168	167	Customer Accts Rec. -- days' sales	160	110	90	90	90	90
20	149	102	110	83	Other Accts Rec. -- days' sales	48	30	13	10	8	6
21	6.4%	5.9%	7.0%	6.3%	Inventories -- % of G F A	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
22					TARGET SELF-FINANCING RATIO % (WB)		20.0%	30.0%	35.0%	35.0%	35.0%
23					EEA Fuel Price as % Int'l Price	26.8%	43.8%	50.0%	63.0%	80.0%	100.0%

case # EEAY210

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED INCOME STATEMENT
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1											
2	35202	37847	39583	41649	Gross Generation(Gwh)	44297	47201	49947	52921	56155	59311
3	33794	36216	37790	39950	Net Energy Sent Out(Gwh)	42481	45266	47699	50751	53852	56879
4	31212	33420	35084	37429	Net Energy Sold(Gwh)	39864	42612	45346	48213	51267	54352
5	16.4	22.0	24.0	30.5	Average Tariff (Millimes/Kwh)	43.1	59.5	125.5	157.0	185.5	222.5
6											
7											
8											
9					OPERATING REVENUE						
10	513.2	734.9	840.4	1,142.9	Sales of Electricity	1,716.8	2,535.4	5,690.9	7,569.5	9,510.1	12,093.2
11	0.2	0.4	0.9	0.9	Other operating Revenue						
12											
13	513.5	735.3	841.3	1,143.8	TOTAL OPERATING REVENUE	1,716.8	2,535.4	5,690.9	7,569.5	9,510.1	12,093.2
14											
15					OPERATING EXPENSES						
16	147.5	256.1	265.9	330.8	Fuel @ Base Year	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
17					Inflation			792.3	1,511.1	2,412.7	3,660.8
18					Total	552.8	904.2	2,060.4	3,425.0	5,074.9	7,332.0
19		0.7	0.4	1.6	Purchases from Sales @ Base Year	1.5	1.5	1.5	1.5	1.5	1.5
20					Inflation	(0.0)	0.3	0.6	0.8	0.9	1.0
21					Total	1.5	1.9	2.1	2.3	2.5	2.6
22	48.3	58.1	69.5	82.3	Salaries & Wages (Operation only)	90.7	93.3	100.5	105.0	111.0	116.0
23					Inflation	(0.0)	18.7	38.2	52.9	66.0	78.2
24					Total	90.7	111.9	138.7	157.9	177.0	194.2
25	80.6	62.1	112.0	138.2	Materials & Services Input	158.3	164.0	178.1	187.0	199.4	208.4
26					Inflation	(0.0)	32.8	67.7	94.3	118.5	140.5
27					Total	158.3	196.8	245.7	281.3	317.9	348.9
28	38.2	42.7	52.1	60.9	Other Operating Expenses(Admin)	67.1	71.3	75.9	80.8	86.1	90.6
29					Inflation	(0.0)	14.3	28.8	40.7	51.2	60.9
30					Total	67.1	85.6	104.7	121.5	137.3	151.1
31	152.8	133.1	180.3	243.2	Depreciation -- Historical	253.3	282.9	338.2	425.8	540.2	671.0
32					-- Revaluation	285.8	446.6	721.6	897.0	1,026.0	1,124.0
33	152.8	133.1	180.3	243.2	Total	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
34											
35	467.3	552.8	680.3	857.0	TOTAL OPERATING EXPENSES	1,409.5	2,029.9	3,611.6	5,310.9	7,275.8	9,823.8
36											
37											
38	46.2	182.5	161.1	286.8	INCOME FROM OPERATIONS	307.3	505.5	2,079.3	2,258.6	2,234.3	2,269.4
39											
40	148.7	247.1	284.3	432.1	Gross Interest	580.6	880.7	1,238.7	1,657.6	1,950.8	2,154.0
41	34.5	76.0	116.3	168.9	Interest During Construction	121.0	211.1	508.0	708.6	764.7	701.2
42											
43	114.2	171.1	168.1	263.2	NET INTEREST EXPENSE	459.7	669.6	780.7	949.1	1,186.1	1,452.7
44											
45											
46	(68.0)	11.5	(7.0)	23.6	NET OPERATING INCOME	(152.4)	(164.0)	1,298.6	1,309.5	1,048.1	816.7
47											
48	103.1	51.0	82.4	88.4	Non-Operating Income	85.0	85.0	85.0	85.0	85.0	85.0
49	22.0	49.1	51.4	87.9	Less:Non-operating Expenses	75.0	75.0	75.0	75.0	75.0	75.0
50											
51	81.1	2.0	31.0	0.5	Net Non-Operating Income(Loss)	10.0	10.0	10.0	10.0	10.0	10.0
52											
53	13.0	13.4	24.0	24.1	NET INCOME(LOSS)	(142.4)	(154.0)	1,308.6	1,319.5	1,058.1	826.7

case # EEAY210

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED BALANCE SHEET
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					ASSETS						
2					FIXED ASSETS						
3	3,082.0	4,090.2	4,896.0	6,928.4	Gross Fixed Assets in Service	20,304.9	29,240.8	36,335.2	42,941.9	49,357.7	55,567.7
4	629.8	746.6	924.9	1,165.6	Less – Accumulated Depreciation	6,119.2	8,072.5	10,343.3	12,597.1	14,919.1	17,460.1
5											
6	2,452.2	3,343.6	3,971.1	5,762.8	Net Fixed Assets in Service	14,185.7	21,168.3	25,991.9	30,344.9	34,438.6	36,107.6
7	1,054.7	1,661.0	2,537.0	2,468.9	Capital Work-in-Progress	4,308.7	8,331.5	11,688.4	14,458.0	15,424.6	15,889.2
8											
9	3,506.9	5,004.6	6,508.1	8,231.6	TOTAL NET FIXED ASSETS	18,494.4	29,499.8	37,680.3	44,802.9	49,863.1	53,996.7
10											
11		1,544.0	1,544.0	1,544.0	RESERVE FOR FOREIGN DEBT	2,643.9	4,917.7	6,670.3	7,998.5	8,762.8	9,111.5
12											
13	53.5	56.5	56.5	56.5	INVESTMENTS	56.5	56.5	56.5	56.5	56.5	56.5
14											
15	36.1	105.7	131.4	173.0	LONG TERM RECEIVABLES	176.9	176.9	176.9	176.9	176.9	176.9
16											
17					CURRENT ASSETS						
18	165.9	139.3	134.5	192.5	Cash	0.0	0.0	0.0	0.0	0.0	0.0
19	197.0	242.1	344.0	433.6	Inventories	1,015.2	1,462.0	1,816.8	2,147.1	2,467.9	2,778.4
20	191.5	305.0	387.9	524.3	Customer Accts. Receivable	752.6	764.1	1,403.2	1,866.4	2,345.0	2,981.9
21	210.1	204.4	253.0	260.3	Other Accounts Receivable	225.0	210.0	200.0	200.0	200.0	200.0
22											
23	764.4	890.9	1,119.5	1,410.7	TOTAL CURRENT ASSETS	1,992.3	2,436.1	3,420.0	4,213.5	5,012.8	5,960.3
24											
25	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL ASSETS	23,364.5	37,087.0	48,004.0	57,248.3	63,872.2	69,301.9
26											
27											
28					LIABILITIES AND EQUITY						
29					EQUITY						
30	651.0	651.0	651.0	1,570.0	Capital	1,570.0	2,770.0	2,770.0	2,770.0	2,770.0	2,770.0
31	401.7	409.7	425.8	464.6	Reserves	467.5	467.5	467.5	467.5	467.5	467.5
					Foreign Grants for Fixed Assets	242.9	766.7	1,280.7	1,786.3	2,170.7	2,534.5
32					Reserve for Asset Revaluation	8,344.8	14,979.7	18,780.3	21,534.0	23,579.5	25,187.3
33	4.0	3.3	5.4	5.5	Other Provisions	5.1	5.1	5.1	5.1	5.1	5.1
34	35.7	48.7	62.1	86.1	Retained Earnings – prior years	110.2	(32.2)	(186.2)	1,122.4	2,441.9	3,500.0
35	13.1	13.4	23.9	24.1	Profit (Loss) – current year	(142.4)	(154.0)	1,308.6	1,319.5	1,058.1	826.7
36											
37	1,105.4	1,126.1	1,168.3	2,150.3	TOTAL EQUITY	10,598.1	18,802.7	24,426.0	29,004.9	32,492.7	35,291.1
38											
39					LONG-TERM DEBT						
40	1,428.4	3,277.4	3,739.2	4,839.7	Foreign Long-Term Debt	6,907.8	11,420.6	15,333.5	18,632.2	20,490.6	21,816.2
41	1,103.6	1,489.4	1,922.4	1,600.1	Local Long-Term Debt	309.3	218.5	127.7	90.8	90.8	90.8
42											
43	2,532.0	4,766.9	5,661.6	6,439.9	TOTAL LONG-TERM DEBT	7,217.1	11,639.1	15,461.2	18,723.0	20,581.4	21,907.0
44											
45					CURRENT LIABILITIES						
46	145.6	329.3	423.2	655.0	Foreign Debt due within one year	408.4	569.4	669.6	839.4	1,050.9	1,067.9
47	28.0	52.1	64.5	90.8	Local Debt due within one year	1,290.8	90.8	90.8	36.9	0.0	0.0
48	18.1	23.6	22.3	33.5	Accounts Payable – Suppliers	46.1	75.4	171.7	285.4	422.9	611.0
49	339.9	590.1	870.0	1,189.8	Ministry of Finance	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0
50	147.8	604.3	996.0	739.7	Other Accounts Payable	800.0	800.0	800.0	800.0	800.0	800.0
51	22.8	79.7	106.6	76.3	Deferred Liabilities	75.0	75.0	75.0	75.0	75.0	75.0
52	20.8	25.2	41.2	34.8	Deposits	35.0	35.0	35.0	35.0	35.0	35.0
53	0.0	0.0	2.1	2.1	Provision for Taxes						
54	0.6	4.5	3.6	3.7	Overdraft/Cash Requirement	1,694.0	3,799.6	5,074.7	6,248.8	7,214.2	8,314.9
55											
56	723.6	1,708.8	2,529.5	2,825.7	TOTAL CURRENT LIABILITIES	5,549.3	6,645.2	8,116.8	9,520.5	10,798.0	12,103.8
57											
58	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL LIABILITIES	23,364.5	37,087.0	48,004.0	57,248.3	63,872.2	69,301.9

case # EEAY210

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED SOURCES AND USES OF FUNDS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SOURCES OF FUNDS						
2					==========						
3											
4					INTERNAL CASH GENERATION						
5	127.2	184.5	192.0	287.3	Gross Income before Interest	317.3	515.5	2,089.3	2,268.6	2,244.3	2,279.4
6	148.6	116.8	178.3	240.7	Depreciation	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
7											
8	275.9	301.3	370.3	528.0	TOTAL INTERNAL CASH GENERATION	856.3	1,245.1	3,149.2	3,591.4	3,810.5	4,074.4
9											
10					EXTERNAL SOURCES						
11	0.0	0.0	0.0	919.0	Increase in Equity Capital	0.0	1,200.0	0.0	0.0	0.0	0.0
12	129.6	7.3	18.2	38.9	Change in Reserves & Provisions	2.5	0.0	0.0	0.0	0.0	0.0
					Foreign Grants	242.9	523.7	514.0	505.6	384.3	363.8
13											
14	238.6	2,163.3	887.6	1,692.6	New Long Term Debt — Foreign	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
15	267.6	420.4	495.2	(167.6)	New Long Term Debt — Local	0.0	0.0	0.0	0.0	0.0	0.0
16											
17	506.2	2,583.7	1,382.8	1,524.9	Total New Long Term Debt	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
18											
19	911.9	2,892.3	1,771.4	3,010.8	TOTAL SOURCES OF FUNDS	2,478.3	5,936.6	6,576.2	6,962.3	6,372.6	6,499.9
20											
21					APPLICATIONS OF FUNDS						
22					==========						
23											
24	498.2	3,158.5	1,681.7	1,964.3	CAPITAL EXPENDITURES (incl.IDC)	2,457.1	5,100.0	5,439.8	5,691.7	4,581.0	4,320.7
25											
26					DEBT SERVICE						
27	121.3	130.7	331.9	360.3	Foreign Debt Repayment	655.0	567.9	652.5	725.0	872.1	1,067.7
28	44.6	10.4	49.8	128.3	Local Debt Repayment	90.8	1,290.8	90.8	90.8	36.9	0.0
29	114.2	171.1	168.1	263.2	Interest (Net of IDC)	459.7	669.6	780.7	949.1	1,186.1	1,452.7
30											
31	280.1	312.2	549.8	751.7	TOTAL NET DEBT SERVICE	1,205.5	2,528.2	1,524.0	1,764.9	2,095.2	2,520.4
32											
33	0.0	3.0	0.0	0.0	INCREASE IN INVESTMENTS	0.0	0.0	0.0	0.0	0.0	0.0
34											
35	(3.0)	69.6	25.7	41.6	INCREASE IN LONG TERM RECEIVABLES	3.9	0.0	0.0	0.0	0.0	0.0
36											
37	121.7	(620.6)	(481.9)	195.2	NET INCREASE IN WORKING CAPITAL	694.7	414.0	887.5	679.8	661.8	759.3
38					(Excluding Cash, Overdraft,LTD)						
39											
40	897.0	2,922.7	1,775.4	2,952.9	TOTAL APPLICATIONS OF FUNDS	4,361.2	8,042.2	7,851.3	8,136.4	7,338.0	7,600.5
41											
42	14.8	(30.4)	(4.0)	58.0	NET CHANGE IN CASH	(1,882.8)	(2,105.6)	(1,275.1)	(1,174.1)	(965.4)	(1,100.6)
43											
44	150.5	165.3	134.9	130.9	OPENING CASH	188.8	(1,694.1)	(3,799.6)	(5,074.7)	(6,248.8)	(7,214.3)
45											
46	165.3	134.9	130.9	188.8	CLOSING CASH	(1,694.1)	(3,799.6)	(5,074.7)	(6,248.8)	(7,214.3)	(8,314.9)

case # EEAY210

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED TRENDS AND RATIOS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)–Annual Growth –%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)–Annual Growth –%	50.21%	47.68%	124.46%	33.01%	25.64%	27.16%
5											
6	16.4	22.0	24.0	30.5	Average Tariff —EL mills/kwh	43.1	59.5	125.5	157.0	185.5	222.5
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales – %	32.2%	35.7%	36.2%	45.2%	53.4%	60.6%
11	9.0%	24.6%	19.2%	25.1%	Operating Income to Sales – %	17.9%	19.9%	36.5%	29.8%	23.5%	18.8%
12					Operating Income to Gross Assets						
13					In Service (Average) – %:						
14	2.5%	4.3%	3.0%	4.1%	–historical	6.7%	9.2%	22.2%	19.7%	16.3%	13.8%
15					–revalued	1.6%	1.9%	5.8%	5.2%	4.4%	3.9%
16					Net Income to Equity – %:						
17	2.3%	1.2%	2.1%	1.5%	–historical	6.5%	9.6%	42.9%	33.8%	25.4%	20.5%
18					–revalued	–2.2%	–1.0%	6.1%	4.9%	3.4%	2.4%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	–20.5%	Self–Financing Ratio (WB)– %	–32.9%	–39.2%	13.6%	21.9%	21.7%	18.0%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.26	0.38	0.97	1.11	1.18	1.26
		0.3%	–7.8%	–10.9%	Self–Financing Ratio (RCG)– %	–11.0%	–29.6%	30.0%	34.9%	35.3%	35.3%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.4	0.4	0.4	0.5	0.5
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales – months	–11.8	–18.0	–10.7	–9.9	–9.1	–8.3
29	136	151	168	167	Accts.Receivable to Sales –days	160	110	90	90	90	90
30					Debt to Equity Ratio – %						
31	244.8%	457.2%	526.4%	334.2%	–historical	395.7%	321.7%	287.3%	262.3%	242.7%	227.4%
32					–revalued	84.1%	65.4%	66.4%	67.6%	68.6%	65.1%

EGYPTIAN ELECTRICITY SYSTEM

TABULATION OF KEY RESULTS

Date: 17-Sep
EEA FILE EEAY210
EDA FILE EDAY210

Year end June 30	Est. 1991	Forecast 1992	1993	1994	1995	1996
1 Border Price -- Mazout -- $/Tonne	70.1	64.7	74.7	84.2	86.7	90.5
LE/Tonne	231.4	279.0	369.0	450.6	482.2	511.1
2 Exchange Rate	3.300	4.310	4.940	5.350	5.560	5.650
3 Mazout Transfer Price to EEA						
--LE/Tonne	55.0	83.7	184.5	283.9	385.7	511.1
4 Gas Transfer Price to EEA						
--LE/Tonne	66.0	98.3	184.5	283.9	385.7	511.1
5 Mazout price to EEA as % Mazout Border Price	23.8%	30.0%	50.0%	63.0%	80.0%	100.0%
Gas price to EEA as % Mazout Border Price	28.5%	35.2%	50.0%	63.0%	80.0%	100.0%
6 Target Self-finacing Ratio (WB) - %	0.0%	20.0%	30.0%	35.0%	35.0%	35.0%
7 Self-financing Ratio -- WB Definition	-32.9%	-39.2%	13.6%	21.9%	21.7%	18.0%
-- RCG Definition	-11.0%	-29.6%	30.0%	34.9%	35.3%	35.3%
8 Revenue Requirement for Above Assumptions (Milliemes / kwh)						
-- EEA Requirement	43.1	59.5	125.5	157.0	185.5	222.5
-- EDA Requirement	70.2	91.4	197.8	247.4	292.3	350.6
-- System Requirement	61.6	81.2	179.4	225.1	266.6	320.6
9 % Real Increase Required						
-- EEA		38.2%	110.9%	25.1%	18.2%	19.9%
-- EDA		30.1%	116.4%	25.1%	18.2%	19.9%
-- System		31.9%	120.8%	25.5%	18.4%	20.3%

APPENDIX L: CASE EEA-Y200: CASE WITHOUT INFLATION

case # EEAY200

EGYPTIAN ELECTRICITY AUTHORITY

INPUT ASSUMPTIONS

	Actual					Est.	Forecast				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1	1.350	2.310	2.599	2.750	Exchange Rate -- L.E./US$	3.300	4.310	4.940	5.350	5.560	5.650
2				3.70%	Inflation Rate -- International %	8.70%	6.20%	2.20%	1.70%	2.50%	3.10%
3				15.00%	-- Egyptian %	20.00%	20.00%	15.00%	9.00%	6.00%	5.00%
4			0.8868	0.9200	Inflation Index -- International	1.0000	1.0620	1.0854	1.1038	1.1314	1.1665
5			0.7246	0.8333	Inflation Index -- Egyptian	1.0000	1.2000	1.3800	1.5042	1.5945	1.6742
6	4.00%	4.31%	4.53%	4.08%	Station Losses -- %	4.10%	4.10%	4.10%	4.10%	4.10%	4.10%
7	7.64%	7.72%	7.16%	6.31%	System Losses -- %	6.16%	5.86%	5.33%	5.00%	4.80%	4.44%
8					International Fuel Prices ($/MBTU) --						
9			4.69	4.69	-- Distillate	4.14	3.93	4.18	4.37	4.51	4.71
10			2.43	2.43	-- Residual	1.69	1.56	1.80	2.03	2.09	2.18
11			2.43	2.43	-- Natural Gas	1.69	1.56	1.80	2.03	2.09	2.18
12			1.80	1.80	-- Coal	1.80	1.80	1.80	1.80	1.80	1.80
13					* IF INFLATION IS TO BE PUT INTO *	*******					
14					* FORECAST, INSERT "1" HERE >>>>>>	0	<<<<<< OTHERWISE, SET AT "0"				
15						*******					
16					Interest Rate on New FX Loans -%	7.00%	*******	*******	*******	*******	*******
17					Interest Rate on New EL Loans -%	11.25%	*******	*******	*******	*******	*******
18	5.0%	3.3%	3.7%	3.5%	Depreciation Expense Rate %	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
19	136	151	168	167	Customer Accts Rec. -- days' sales	160	110	90	90	90	90
20	149	102	110	83	Other Accts Rec. -- days' sales	48	30	17	14	12	10
21	6.4%	5.9%	7.0%	6.3%	Inventories -- % of G F A	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
22					TARGET SELF-FINANCING RATIO % (WB)		20.0%	30.0%	35.0%	35.0%	35.0%
23					EEA Fuel Price as % Int'l Price	26.8%	43.8%	50.0%	63.0%	80.0%	100.0%

case # EEAY200

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED INCOME STATEMENT
(At Base Year Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1											
2	35202	37847	39583	41649	Gross Generation(Gwh)	44297	47201	49947	52921	56155	59311
3	33794	36216	37790	39950	Net Energy Sent Out(Gwh)	42451	45266	47899	50751	53852	56879
4	31212	33420	35084	37429	Net Energy Sold(Gwh)	39864	42612	45346	48213	51267	54352
5	16.4	22.0	24.0	30.5	Average Tariff (Millimes/Kwh)	43.1	59.5	96.5	110.5	121.5	136.5
6											
7											
8											
9					OPERATING REVENUE						
10	513.2	734.9	840.4	1,142.9	Sales of Electricity	1,716.8	2,535.4	4,375.9	5,327.6	6,229.0	7,419.0
11	0.2	0.4	0.9	0.9	Other operating Revenue						
12											
13	513.5	735.3	841.3	1,143.8	TOTAL OPERATING REVENUE	1,716.8	2,535.4	4,375.9	5,327.6	6,229.0	7,419.0
14											
15					OPERATING EXPENSES						
16	147.5	256.1	265.9	330.8	Fuel @ Base Year	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
17					Inflation			0.0	0.0	0.0	0.0
18					Total	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
19		0.7	0.4	1.6	Purchases from Sales @ Base Year	1.5	1.5	1.5	1.5	1.5	1.5
20					Inflation	0.0	0.0	0.0	0.0	0.0	0.0
21					Total	1.5	1.5	1.5	1.5	1.5	1.5
22	48.3	58.1	69.5	82.3	Salaries & Wages (Operation only)	90.7	93.3	100.5	105.0	111.0	116.0
23					Inflation	0.0	0.0	0.0	0.0	0.0	0.0
24					Total	90.7	93.3	100.5	105.0	111.0	116.0
25	80.6	62.1	112.0	138.2	Materials & Services Input	158.3	164.0	178.1	187.0	199.4	208.4
26					Inflation	0.0	0.0	0.0	0.0	0.0	0.0
27					Total	158.3	164.0	178.1	187.0	199.4	208.4
28	38.2	42.7	52.1	60.9	Other Operating Expenses(Admin)	67.1	71.3	75.9	80.8	86.1	90.3
29					Inflation	0.0	0.0	0.0	0.0	0.0	0.0
30					Total	67.1	71.3	75.9	80.8	86.1	90.3
31	152.8	133.1	180.3	243.2	Depreciation -- Historical	253.3	282.9	336.5	418.2	521.8	637.4
32					-- Revaluation	0.0	0.0	0.0	0.0	0.0	0.0
33	152.8	133.1	180.3	243.2	Total	253.3	282.9	336.5	418.2	521.8	637.4
34											
35	467.3	552.8	680.3	857.0	TOTAL OPERATING EXPENSES	1,123.8	1,517.3	1,960.7	2,706.4	3,582.1	4,724.9
36											
37											
38	46.2	182.5	161.1	286.8	INCOME FROM OPERATIONS	593.1	1,018.1	2,415.2	2,621.1	2,646.9	2,69[illegible].1
39											
40	148.7	247.1	284.3	432.1	Gross Interest	542.6	748.3	1,054.5	1,327.8	1,537.4	1,658.0
41	34.5	76.0	116.3	168.9	Interest During Construction	121.0	211.1	479.8	661.6	699.9	628.0
42											
43	114.2	171.1	168.1	263.2	NET INTEREST EXPENSE	421.6	537.1	574.6	666.3	837.5	1,029.9
44											
45											
46	(68.0)	11.5	(7.0)	23.6	NET OPERATING INCOME	171.4	481.0	1,840.6	1,954.8	1,809.4	1,664.2
47											
48	103.1	51.0	82.4	88.4	Non-Operating Income	85.0	85.0	85.0	85.0	85.0	85.0
49	22.0	49.1	51.4	87.9	Less:Non-operating Expenses	75.0	75.0	75.0	75.0	75.0	75.0
50											
51	81.1	2.0	31.0	0.5	Net Non-Operating Income(Loss)	10.0	10.0	10.0	10.0	10.0	10.0
52											
53	13.0	13.4	24.0	24.1	NET INCOME(LOSS)	181.4	491.0	1,850.6	1,964.8	1,819.4	1,674.2

case # EEAY200

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED BALANCE SHEET
(At Base Year Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					ASSETS						
2					FIXED ASSETS						
3	3,082.0	4,090.2	4,896.0	6,928.4	Gross Fixed Assets in Service	7,545.6	8,622.8	10,605.9	13,292.1	16,523.8	19,901.9
4	629.8	746.6	924.9	1,165.6	Less – Accumulated Depreciation	1,418.9	1,701.8	2,038.4	2,456.6	2,978.3	3,615.8
5											
6	2,452.2	3,343.6	3,971.1	5,762.8	Net Fixed Assets in Service	6,126.7	6,920.9	8,567.6	10,835.5	13,545.5	16,286.1
7	1,054.7	1,661.0	2,537.0	2,468.9	Capital Work-in-Progress	4,308.7	7,932.6	10,744.6	12,927.0	13,512.1	13,617.7
8											
9	3,506.9	5,004.6	6,508.1	8,231.6	TOTAL NET FIXED ASSETS	10,435.4	14,853.6	19,312.2	23,762.5	27,057.6	29,903.7
10											
11		1,544.0	1,544.0	1,544.0	RESERVE FOR FOREIGN DEBT	2,643.9	4,917.7	6,645.0	7,937.7	8,673.2	9,005.5
12											
13	53.5	56.5	56.5	56.5	INVESTMENTS	56.5	56.5	56.5	56.5	56.5	56.5
14											
15	36.1	105.7	131.4	173.0	LONG TERM RECEIVABLES	176.9	176.9	176.9	176.9	176.9	176.9
16											
17					CURRENT ASSETS						
18	165.9	139.3	134.5	192.5	Cash	0.0	0.0	0.0	0.0	0.0	0.0
19	197.0	242.1	344.0	433.6	Inventories	377.3	431.1	530.3	664.6	826.2	995.1
20	191.5	305.0	387.9	524.3	Customer Accts. Receivable	752.6	764.1	1,079.0	1,313.6	1,535.9	1,829.3
21	210.1	204.4	253.0	260.3	Other Accounts Receivable	225.0	210.0	200.0	200.0	200.0	200.0
22											
23	764.4	890.9	1,119.5	1,410.7	TOTAL CURRENT ASSETS	1,354.9	1,405.2	1,809.3	2,178.2	2,562.1	3,024.4
24											
25	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL ASSETS	14,667.6	21,409.9	27,999.8	34,111.8	38,526.3	42,167.0
26											
::											
27											
28					LIABILITIES AND EQUITY						
29					EQUITY						
30	651.0	651.0	651.0	1,570.0	Capital	1,570.0	2,770.0	2,770.0	2,770.0	2,770.0	2,770.0
31	401.7	409.7	425.8	464.6	Reserves	467.5	467.5	467.5	467.5	467.5	467.5
					Foreign Grants for Fixed Assets	242.9	736.1	1,209.7	1,667.8	2,007.5	2,319.4
32					Reserve for Asset Revaluation	0.0	0.0	0.0	0.0	0.0	0.0
33	4.0	3.3	5.4	5.5	Other Provisions	5.1	5.1	5.1	5.1	5.1	5.1
34	35.7	48.7	62.1	86.1	Retained Earnings – prior years	110.2	291.6	782.6	2,633.2	4,598.0	6,417.4
35	13.1	13.4	23.9	24.1	Profit (Loss) – current year	181.4	491.0	1,850.6	1,964.8	1,819.4	1,674.2
36											
37	1,105.4	1,126.1	1,168.3	2,150.3	TOTAL EQUITY	2,577.1	4,761.2	7,085.5	9,508.4	11,667.5	13,653.5
38											
39					LONG-TERM DEBT						
40	1,428.4	3,277.4	3,739.2	4,839.7	Foreign Long-Term Debt	6,907.8	11,247.4	14,905.8	17,899.5	19,491.1	20,521.5
41	1,103.6	1,489.4	1,922.4	1,600.1	Local Long-Term Debt	309.3	218.5	127.7	90.8	90.8	90.8
42											
43	2,532.0	4,766.9	5,661.6	6,439.9	TOTAL LONG-TERM DEBT	7,217.1	11,465.9	15,033.5	17,990.3	19,581.9	20,612.3
44											
45					CURRENT LIABILITIES						
46	145.6	329.3	423.2	655.0	Foreign Debt due within one year	408.4	509.4	689.6	839.4	1,036.0	1,052.8
47	28.0	52.1	64.5	90.8	Local Debt due within one year	1,290.8	90.8	90.8	36.9	0.0	0.0
48	18.1	23.6	22.3	33.5	Accounts Payable – Suppliers	46.1	75.4	105.7	159.5	221.9	305.9
49	339.9	590.1	870.0	1,189.8	Ministry of Finance	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0
50	147.8	604.3	906.0	739.7	Other Accounts Payable	800.0	800.0	800.0	800.0	800.0	800.0
51	22.8	79.7	106.6	76.3	Deferred Liabilities	75.0	75.0	75.0	75.0	75.0	75.0
52	20.0	25.2	41.2	34.8	Deposits	35.0	35.0	35.0	35.0	35.0	35.0
53	0.0	0.0	2.1	2.1	Provision for Taxes						
54	0.6	4.5	3.6	3.7	Overdraft/Cash Requirement	1,018.1	2,337.2	2,904.8	3,467.4	3,909.1	4,432.5
55											
56	723.6	1,708.8	2,529.5	2,825.7	TOTAL CURRENT LIABILITIES	4,873.3	5,182.8	5,880.9	6,613.1	7,276.9	7,901.2
57											
58	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL LIABILITIES	14,667.6	21,409.9	27,999.8	34,111.8	38,526.3	42,167.0

case # EEAY200

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED SOURCES AND USES OF FUNDS

(At Base Year Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SOURCES OF FUNDS						
2					==========						
3											
4					INTERNAL CASH GENERATION						
5	127.2	184.5	192.0	287.3	Gross Income before Interest	603.1	1,028.1	2,425.2	2,631.1	2,656.9	2,704.1
6	148.6	116.8	178.3	240.7	Depreciation	253.3	282.9	336.5	418.2	521.8	637.4
7											
8	275.9	301.3	370.3	528.0	TOTAL INTERNAL CASH GENERATION	856.3	1,311.1	2,761.7	3,049.3	3,178.7	3,341.6
9											
10					EXTERNAL SOURCES						
11	0.0	0.0	0.0	919.0	Increase in Equity Capital	0.0	1,200.0	0.0	0.0	0.0	0.0
12	129.8	7.3	18.2	38.9	Change in Reserves & Provisions	2.5	0.0	0.0	0.0	0.0	0.0
					Foreign Grants	242.9	493.2	473.6	458.1	339.7	311.9
13											
14	238.6	2,163.3	887.6	1,692.6	New Long Term Debt — Foreign	1,376.6	2,794.6	2,683.8	2,595.8	1,924.8	1,767.4
15	267.6	420.4	495.2	(167.6)	New Long Term Debt — Local	0.0	0.0	0.0	0.0	0.0	0.0
16											
17	506.2	2,583.7	1,382.8	1,524.9	Total New Long Term Debt	1,376.6	2,794.6	2,683.8	2,595.8	1,924.8	1,767.4
18											
19	911.9	2,892.3	1,771.4	3,010.8	TOTAL SOURCES OF FUNDS	2,478.3	5,798.8	5,919.2	6,103.2	5,443.2	5,420.9
20											
21					APPLICATIONS OF FUNDS						
22					==========						
23											
24	498.2	3,158.5	1,681.7	1,964.3	CAPITAL EXPENDITURES (incl.IDC)	2,457.1	4,701.1	4,795.1	4,868.5	3,816.9	3,483.6
25											
26					DEBT SERVICE						
27	121.3	130.7	331.9	360.3	Foreign Debt Repayment	655.0	567.9	652.5	725.0	872.1	1,052.6
28	44.6	10.4	49.8	128.3	Local Debt Repayment	90.8	1,290.8	90.8	90.8	36.9	0.0
29	114.2	171.1	168.1	263.2	Interest (Net of IDC)	421.6	537.1	574.6	666.3	837.5	1,029.9
30											
31	280.1	312.2	549.8	751.7	TOTAL NET DEBT SERVICE	1,167.4	2,395.8	1,317.9	1,482.1	1,746.5	2,082.5
32											
33	0.0	3.0	0.0	0.0	INCREASE IN INVESTMENTS	0.0	0.0	0.0	0.0	0.0	0.0
34											
35	(3.0)	69.6	25.7	41.6	INCREASE IN LONG TERM RECEIVABLES	3.9	0.0	0.0	0.0	0.0	0.0
36											
37	121.7	(620.6)	(481.9)	195.2	NET INCREASE IN WORKING CAPITAL	56.8	21.1	373.7	315.2	321.5	378.2
38					(Excluding Cash, Overdraft,LTD)						
39											
40	897.0	2,922.7	1,775.4	2,952.9	TOTAL APPLICATIONS OF FUNDS	3,685.2	7,118.0	6,486.7	6,665.8	5,884.9	5,944.4
41											
42	14.8	(30.4)	(4.0)	58.0	NET CHANGE IN CASH	(1,206.9)	(1,319.1)	(567.5)	(562.6)	(441.7)	(523.5)
43											
44	150.5	165.3	134.9	130.9	OPENING CASH	188.8	(1,018.1)	(2,337.2)	(2,904.8)	(3,467.4)	(3,909.1)
45											
46	165.3	134.9	130.9	188.8	CLOSING CASH	(1,018.1)	(2,337.2)	(2,904.8)	(3,467.4)	(3,909.1)	(4,432.6)

case # EEAY200

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED TRENDS AND RATIOS

(At Base Year Prices)

	--------Actual--------					Est.	----------Forecast----------				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)–Annual Growth –%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)–Annual Growth –%	50.21%	47.68%	72.59%	21.75%	16.92%	19.10%
5											
6	16.4	22.0	24.0	30.5	Average Tariff —EL mills/kwh	43.1	59.5	96.5	110.5	121.5	136.5
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales – %	32.2%	35.7%	29.0%	35.9%	42.7%	49.5%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales – %	34.5%	40.2%	55.2%	49.2%	42.5%	36.3%
12					Operating Income to Gross Assets						
13					in Service (Average) – %:						
14	2.5%	4.3%	3.0%	4.1%	–historical	7.0%	10.8%	21.5%	18.8%	15.3%	12.8%
15					–revalued	7.0%	10.8%	21.5%	18.8%	15.3%	12.8%
16					Net Income to Equity – %:						
17	2.3%	1.2%	2.1%	1.5%	–historical	7.7%	13.4%	31.2%	23.7%	17.2%	13.2%
18					–revalued	7.7%	13.4%	31.2%	23.7%	17.2%	13.2%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	–20.5%	Self–Financing Ratio (WB)– %	–12.1%	–27.8%	22.3%	27.9%	27.4%	24.5%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.31	0.48	1.02	1.12	1.17	1.23
		0.3%	–7.8%	–10.9%	Self–Financing Ratio (RCG)– %	–10.2%	–27.2%	30.2%	34.9%	35.3%	35.0%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.3	0.3	0.3	0.3	0.4	0.4
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales – months	–7.1	–11.1	–8.0	–7.8	–7.5	–7.2
29	136	151	168	167	Accts.Receivable to Sales –days	160	110	90	90	90	90
30					Debt to Equity Ratio – %						
31	244.8%	457.2%	526.4%	334.2%	–historical	346.0%	254.7%	222.9%	198.4%	176.7%	158.7%
32					–revalued	346.0%	254.7%	222.9%	198.4%	176.7%	158.7%

EGYPTIAN ELECTRICITY SYSTEM

TABULATION OF KEY RESULTS

Date: 17-Sep
EEA FILE EEAY200
EDA FILE EDAY200

Year end June 30	Est. 1991	Forecast 1992	1993	1994	1995	1996
1 Border Price -- Mazout -- $/Tonne	70.1	64.7	74.7	84.2	86.7	90.5
LE/Tonne	231.4	279.0	369.0	450.6	482.2	511.1
2 Exchange Rate	3.300	4.310	4.940	5.350	5.560	5.650
3 Mazout Transfer Price to EEA						
--LE/Tonne	55.0	83.7	184.5	283.9	385.7	511.1
4 Gas Transfer Price to EEA						
--LE/Tonne	66.0	98.3	184.5	283.9	385.7	511.1
5 Mazout price to EEA as % Mazout Border Price	23.8%	30.0%	50.0%	63.0%	80.0%	100.0%
Gas price to EEA as % Mazout Border Price	28.5%	35.2%	50.0%	63.0%	80.0%	100.0%
6 Target Self-finacing Ratio (WB) - %	0.0%	20.0%	30.0%	35.0%	35.0%	35.0%
7 Self-financing Ratio -- WB Definition	-12.1%	-27.8%	22.3%	27.9%	27.4%	24.5%
-- RCG Definition	-10.2%	-27.2%	30.2%	34.9%	35.3%	35.0%
8 Revenue Requirement for Above Assumptions (Milliemes / kwh)						
-- EEA Requirement	43.1	59.5	96.5	110.5	121.5	136.5
-- EDA Requirement	70.2	91.4	155.5	178.0	195.7	219.9
-- System Requirement	61.6	81.2	140.5	161.4	177.9	200.4
9 % Real Increase Required						
-- EEA		38.2%	62.2%	14.5%	10.0%	12.3%
-- EDA		30.1%	70.1%	14.5%	10.0%	12.3%
-- System		31.9%	72.9%	14.9%	10.2%	12.7%

APPENDIX M: SUPPORTING DATA FOR BILL FREQUENCY ANALYSIS

Exhibit M-1
Residential Sector Bill Frequency Analysis: Cairo Distribution Company

Block Ending Interval	1989 Customer Bills	1989 Kilowatt-hours (Millions)	Cumulative Customer Bills	Cumulative Kilowatt-hours (Millions)	Percent of Customer Bills	Consolidated Factor	Sales in Interval	Percent Consolidated Factor
0	454,043	0	454,043	0	16.02%	0	0	0.00%
40	421,947	95	875,990	95	30.90%	1,036	1,036	23.44%
50	86,366	47	962,356	142	33.95%	1,266	230	28.66%
60	86,421	57	1,048,777	200	36.99%	1,486	220	33.63%
70	87,344	68	1,136,121	268	40.08%	1,695	209	38.37%
80	92,074	83	1,228,195	351	43.32%	1,893	198	42.86%
90	98,119	100	1,326,314	451	46.78%	2,080	187	47.09%
100	106,165	121	1,432,479	572	50.53%	2,255	175	51.05%
150	515,622	769	1,948,101	1,341	68.72%	2,938	682	66.50%
200	336,069	694	2,284,170	2,035	80.57%	3,357	419	75.99%
250	180,325	480	2,464,495	2,515	86.93%	3,626	269	82.08%
300	96,178	314	2,560,673	2,828	90.32%	3,816	190	86.38%
350	87,280	356	2,647,953	3,184	93.40%	3,970	154	89.87%
400	60,259	266	2,708,212	3,450	95.53%	4,059	89	91.88%
450	33,238	176	2,741,450	3,626	96.70%	4,131	72	93.52%
500	24,336	138	2,765,786	3,764	97.56%	4,179	48	94.61%
550	15,434	100	2,781,220	3,864	98.10%	4,219	40	95.51%
600	11,837	82	2,793,057	3,946	98.52%	4,248	29	96.17%
650	8,239	64	2,801,296	4,010	98.81%	4,273	24	96.72%
700	6,553	53	2,807,848	4,063	99.04%	4,291	19	97.14%
750	4,866	43	2,812,714	4,107	99.21%	4,307	16	97.50%
800	4,062	38	2,816,776	4,145	99.36%	4,320	12	97.78%
850	3,258	33	2,820,034	4,178	99.47%	4,330	11	98.02%
900	2,677	28	2,822,711	4,206	99.57%	4,339	8	98.21%
950	2,096	24	2,824,807	4,230	99.64%	4,346	7	98.37%
1,000	3,297	46	2,828,104	4,275	99.76%	4,358	12	98.65%
1,500	4,498	68	2,832,602	4,343	99.92%	4,386	28	99.28%
2,000	1,297	28	2,833,899	4,371	99.96%	4,397	12	99.54%
2,500	492	14	2,834,391	4,386	99.98%	4,404	6	99.68%
3,000	239	8	2,834,630	4,394	99.99%	4,407	3	99.76%
4,000	189	9	2,834,819	4,403	99.99%	4,411	4	99.85%
5,000	74	4	2,834,893	4,408	100.00%	4,413	2	99.89%
6,000	34	3	2,834,927	4,410	100.00%	4,414	1	99.92%
7,000	20	2	2,834,947	4,412	100.00%	4,415	1	99.94%
8,000	5	1	2,834,952	4,413	100.00%	4,416	1	99.95%
9,000	6	1	2,834,958	4,413	100.00%	4,416	1	99.97%
10,000	2	0	2,834,960	4,414	100.00%	4,416	0	99.97%
100,000	23	4	2,834,983	4,418	100.00%	4,418	1	100.00%
Total	2,834,983	4,418					4,418	
Average use/year		1,558	Average use/month		130			

Exhibit M-2. Residential Sector Bill Frequency Analysis: Alexandria Distribution Company

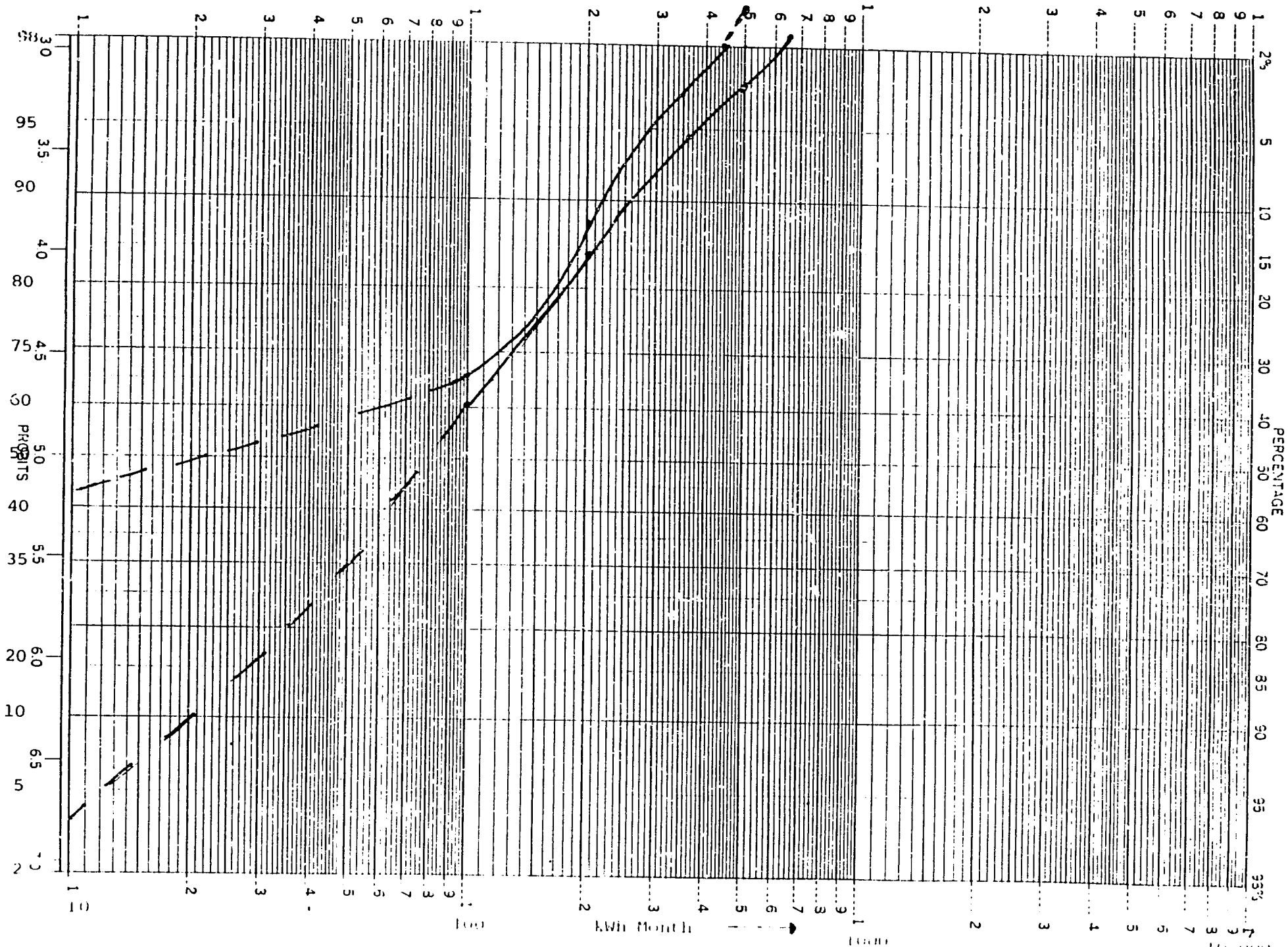

Exhibit M-3
Residential Sector Bill Frequency Analysis: Alexandria Distribution Company

Block Ending Interval	1989 Customer Bills	1989 Kilowatt-hours (Millions)	Cumulative Customer Bills	Cumulative Kilowatt-hours (Millions)	Percent of Customer Bills	Consolidated Factor	Sales in Interval	Percent Consolidated Factor
0	334,110	0	334,110	0	43.21%	0	0	0.00%
100	173,628	142	507,738	142	65.67%	461	461	60.30%
200	182,565	307	690,303	449	89.28%	648	187	84.81%
350	57,373	166	747,676	615	96.70%	722	74	94.51%
500	15,498	65	763,174	680	98.70%	741	18	96.90%
650	4,535	26	767,709	707	99.29%	750	9	98.08%
800	2,193	15	769,902	722	99.57%	754	4	98.65%
1,000	1,290	11	771,192	733	99.74%	757	3	99.08%
2,000	1,615	19	772,807	752	99.95%	762	5	99.70%
4,000	298	7	773,105	759	99.99%	764	2	100.02%
100,000	114	5	773,219	764	100.00%	764	(0)	100.00%
Total	773,219	764					764	
Average Use/Year		988	Average Use/Month		82			

100

Exhibit M-4. Residential Sector Bill Frequency Analysis: South Delta Distribution Company

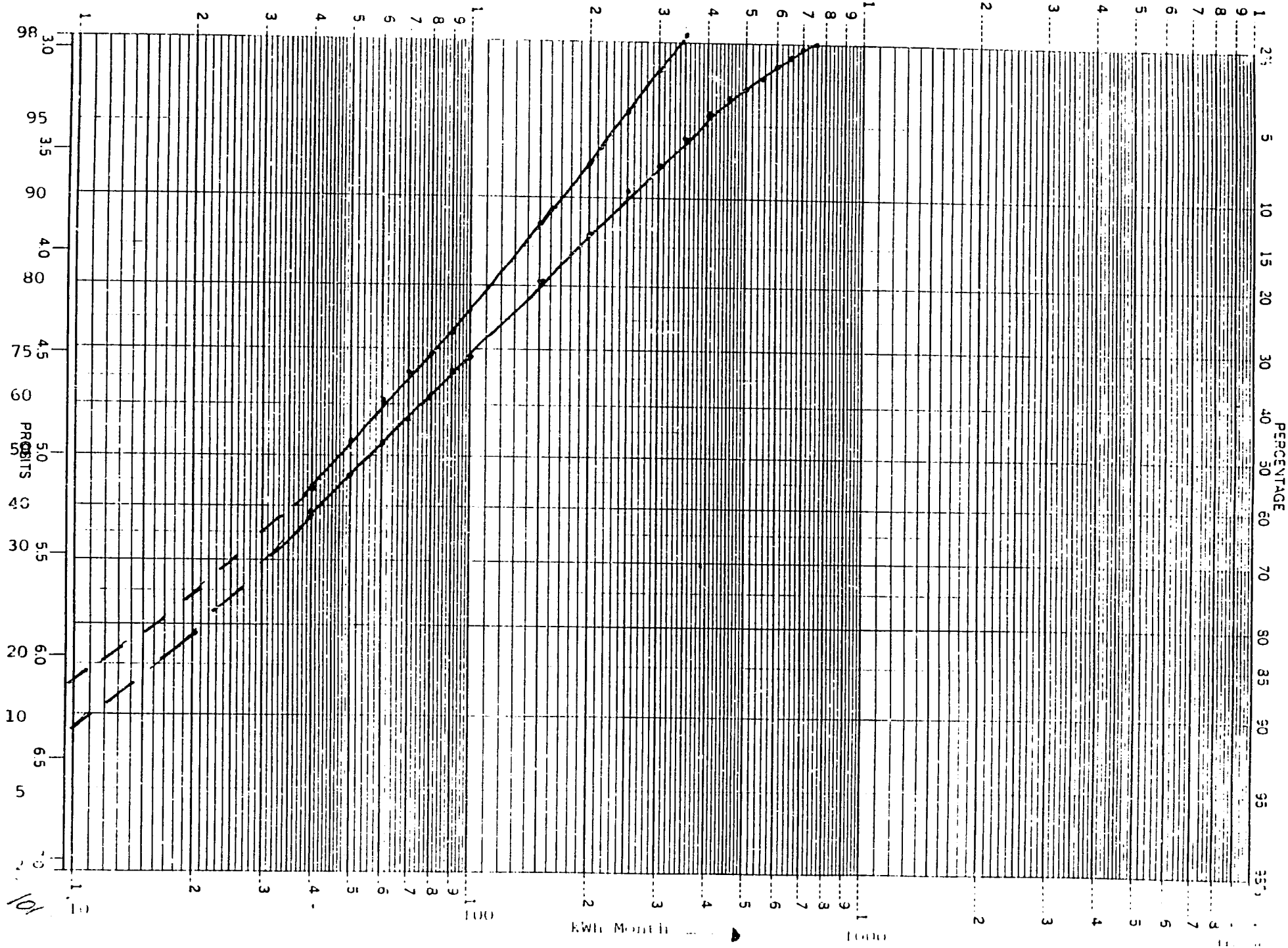

Exhibit M-5
Residential Sector Bill Frequency Analysis: South Delta Distribution Company

Block Ending Interval	1989 Customer Bills	1989 Kilowatt-hours (Millions)	Cumulative Customer Bills	Cumulative Kilowatt-hours (Millions)	Percent of Customer Bills	Consolidated Factor	Sales in Interval	Percent Consolidated Factor
0	84,237	0	84,237	0	7.61%	0	0	0.00%
40	407,187	85	491,424	85	44.42%	380	380	39.87%
50	95,556	51	586,980	136	53.05%	447	67	46.94%
60	80,499	51	667,479	187	60.33%	503	56	52.79%
70	55,717	42	723,196	229	65.36%	551	48	57.83%
80	46,967	41	770,163	270	69.61%	593	42	62.21%
90	39,022	38	809,185	308	73.14%	629	37	66.06%
100	42,377	47	851,562	355	76.97%	661	32	69.39%
150	117,804	167	969,366	522	87.61%	769	108	80.68%
200	57,423	114	1,026,789	636	92.80%	828	59	86.86%
250	32,730	85	1,059,519	722	95.76%	862	35	90.51%
300	16,079	50	1,075,598	772	97.22%	883	21	92.69%
350	9,081	34	1,084,679	806	98.04%	897	14	94 18%
400	5,650	24	1,090,329	830	98.55%	907	10	95.23%
450	3,487	17	1,093,816	847	98.86%	915	8	96.05%
500	4,525	25	1,098,341	872	99.27%	920	5	96.61%
550	1,841	11	1,100,182	883	99.44%	924	4	97.00%
600	1,333	9	1,101,515	892	99.56%	927	3	97.29%
650	783	6	1,102,298	897	99.63%	929	2	97.53%
700	603	5	1,102,901	902	99.68%	931	2	97.75%
750	488	4	1,103,389	906	99.73%	933	2	97.93%
800	377	3	1,103,766	909	99.76%	934	2	98.09%
850	299	3	1,104,065	912	99.79%	936	1	98.22%
900	304	3	1,104,369	915	99.82%	937	1	98.32%
950	192	2	1,104,561	917	99.83%	938	1	98.44%
1,000	330	4	1,104,891	920	99.86%	939	1	98.52%
1,500	909	12	1,105,800	933	99.94%	944	5	99.06%
2,000	307	6	1,106,107	939	99.97%	946	2	99.29%
2,500	117	3	1,106,224	942	99.98%	947	1	99.43%
3,000	68	2	1,106,292	944	99.99%	948	1	99.52%
4,000	63	2	1,106,355	946	100.00%	949	1	99.59%
5,000	16	1	1,106,371	947	100.00%	949	1	99.65%
6,000	10	1	1,106,381	948	100.00%	950	0	99.69%
7,000	4	0	1,106,385	948	100.00%	950	0	99.72%
8,000	4	0	1,106,389	948	100.00%	950	0	99.75%
9,000	4	0	1,106,393	949	100.00%	951	0	99.78%
10,000	2	0	1,106,395	949	100.00%	951	0	99.80%
100,000	15	4	1,106,410	953	100.00%	953	2	100.00%
Total	1,106,410	953					953	
Average Use/Year		861	Average Use/Month		72			

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Exhibit M-6. Residential Sector Bill Frequency Analysis: Nationwide

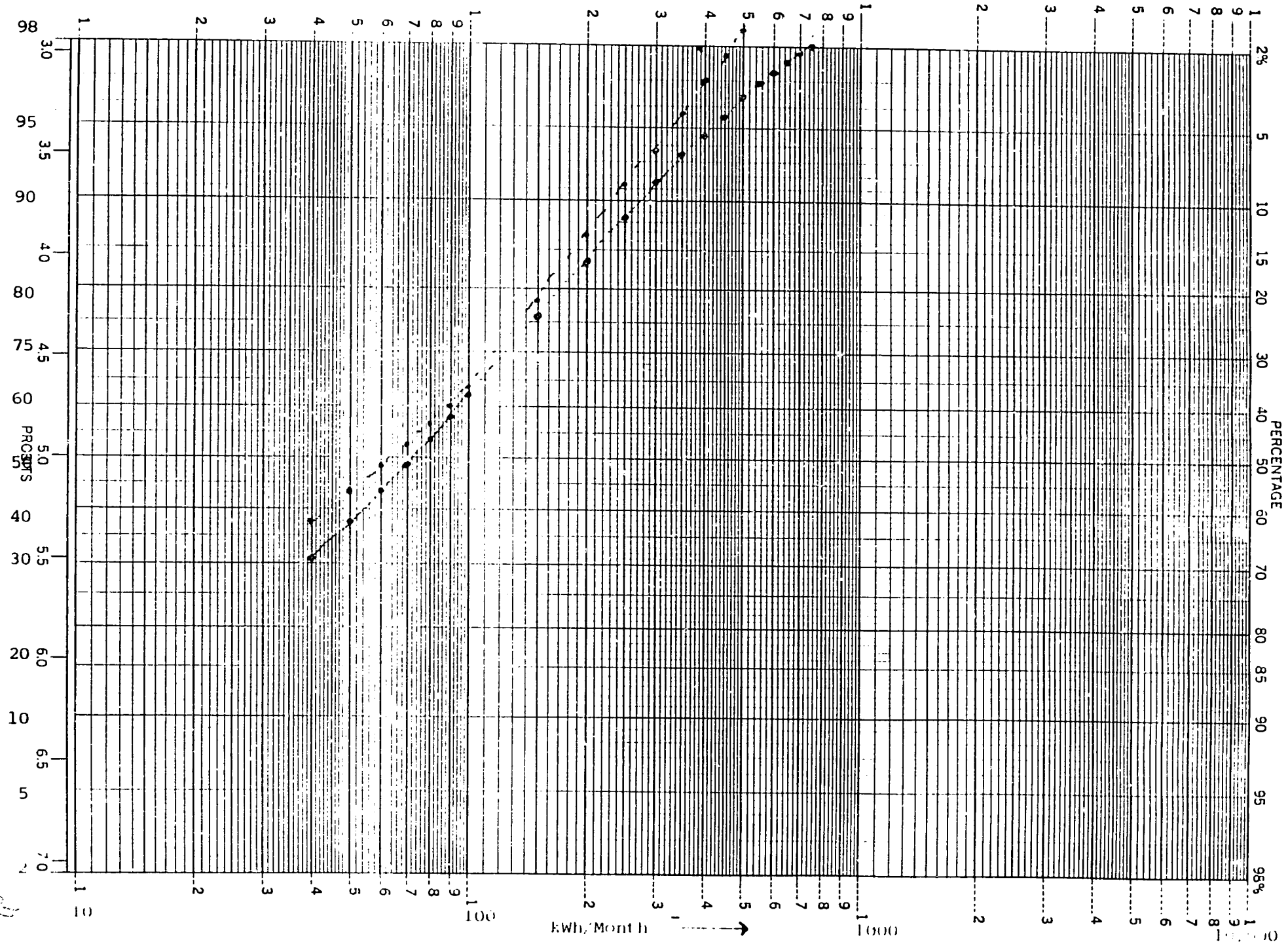


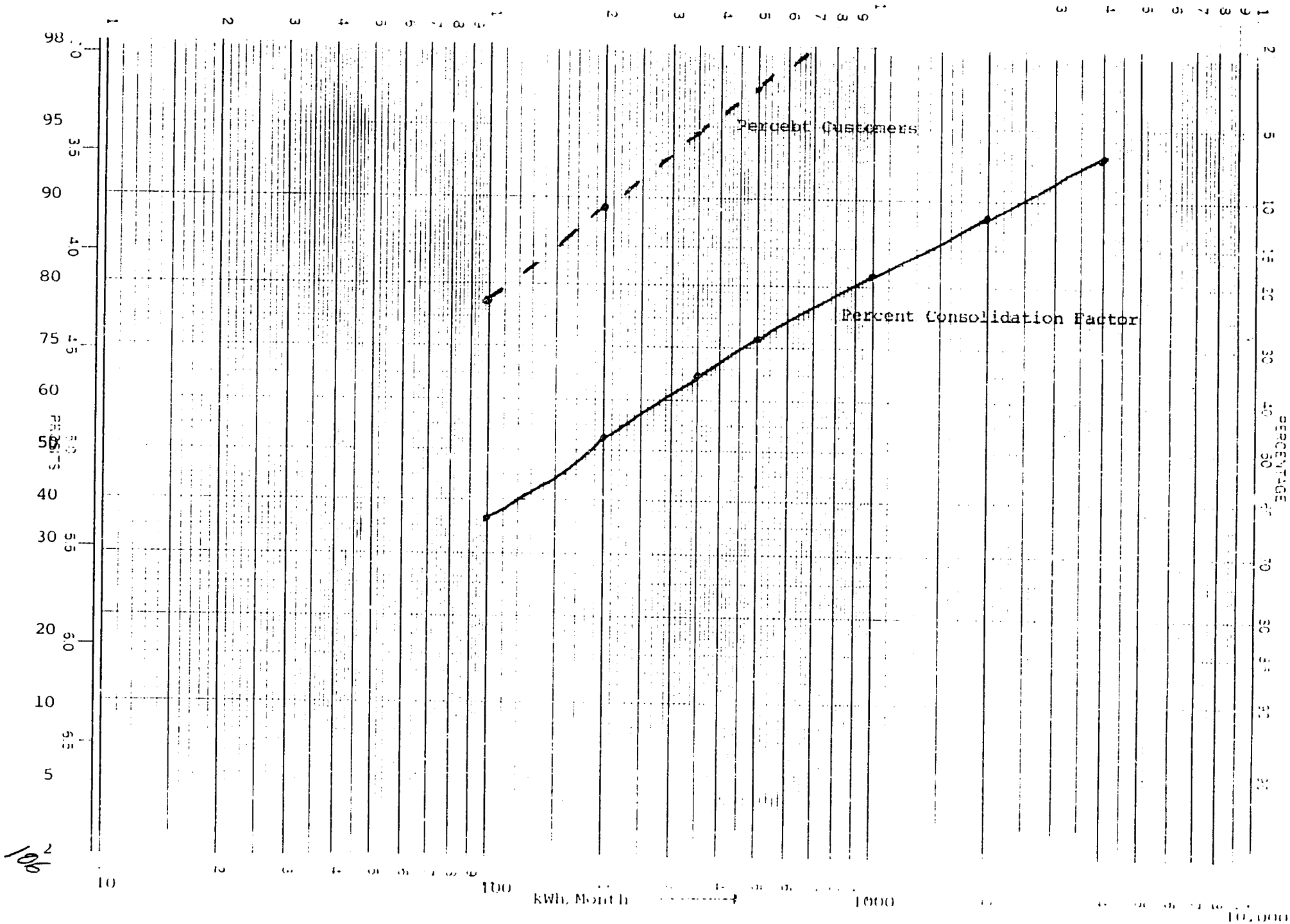
Exhibit M-7
Residential Sector Bill Frequency Analysis: Nationwide

Block Ending Interval (kWh/Month)	1989 Customer Bills	1989 Kilowatt-hours (Millions)	Cumulative Customer Bills	Cumulative Kilowatt-hours (Millions)	Percent of Customer Bills	Consolidated Factor	Sales in Interval	Percent Consolidated Factor
0	1,086,367	0	1,086,367	0	11.81%	0	0	0.00%
40	2,376,294	599	3,462,661	599	37.66%	3,350	3,350	30.92%
50	537,132	347	3,999,794	945	43.50%	4,063	712	37.49%
60	474,654	362	4,474,448	1,308	48.66%	4,707	644	43.44%
70	373,172	323	4,847,620	1,631	52.72%	5,283	576	48.75%
80	344,484	334	5,192,104	1,965	56.47%	5,808	525	53.60%
90	321,273	341	5,513,376	2,306	59.96%	6,283	475	57.98%
100	348,262	416	5,861,639	2,722	63.75%	6,722	439	62.04%
150	1,325,714	1,891	7,187,353	4,613	78.17%	8,227	1,505	75.93%
200	783,624	1,502	7,970,977	6,115	86.69%	9,053	826	83.55%
250	428,442	1,073	8,399,419	7,188	91.35%	9,575	522	88.37%
300	222,788	672	8,622,207	7,859	93.77%	9,922	347	91.57%
350	179,279	629	8,801,485	8,488	95.72%	10,142	220	93.60%
400	121,201	463	8,922,686	8,952	97.04%	10,259	118	94.69%
450	68,393	312	8,991,079	9,264	97.78%	10,366	106	95.67%
500	58,269	311	9,049,348	9,575	98.41%	10,450	84	96.44%
550	32,680	185	9,082,028	9,761	98.77%	10,507	57	96.97%
600	24,735	149	9,106,762	9,910	99.04%	10,546	39	97.33%
650	16,615	109	9,123,377	10,019	99.22%	10,579	33	97.63%
700	13,132	92	9,136,509	10,111	99.36%	10,603	25	97.86%
750	9,919	76	9,146,429	10,187	99.47%	10,625	22	98.06%
800	8,154	66	9,154,583	10,253	99.56%	10,642	16	98.22%
850	6,526	56	9,161,109	10,309	99.63%	10,655	13	98.34%
900	5,605	51	9,166,713	10,360	99.69%	10,666	11	98.44%
950	4,197	41	9,170,910	10,400	99.74%	10,676	10	98.53%
1,000	6,718	77	9,177,628	10,477	99.81%	10,687	11	98.63%
1,500	11,072	153	9,188,700	10,631	99.93%	10,746	59	99.17%
2,000	3,379	68	9,192,079	10,699	99.97%	10,771	26	99.41%
2,500	1,284	35	9,193,363	10,734	99.98%	10,786	14	99.54%
3,000	670	22	9,194,033	10,756	99.99%	10,794	9	99.62%
4,000	568	24	9,194,601	10,780	99.99%	10,804	10	99.71%
5,000	186	10	9,194,788	10,791	100.00%	10,809	5	99.76%
6,000	97	7	9,194,885	10,797	100.00%	10,813	4	99.79%
7,000	49	4	9,194,934	10,801	100.00%	10,815	2	99.81%
8,000	25	3	9,194,958	10,804	100.00%	10,818	2	99.84%
9,000	26	3	9,194,985	10,808	100.00%	10,820	2	99.86%
10,000	12	2	9,194,996	10,809	100.00%	10,821	2	99.87%
100,000	100	26	9,195,096	10,835	100.00%	10,835	14	100.00%
Total	9,195,096	10,835	0.00%				10,835	
Average Use/Year		1,178	Average Use/Month		98			

Exhibit M-8
Commercial Sector Bill Frequency Analysis

Block Ending Interval (kWh/Month)	Percent of Customer Bills	Percent Consolidated Factor
0	0.00%	0.00%
100	77.39%	36.33%
200	89.03%	52.52%
350	94.87%	64.80%
500	96.88%	71.45%
1,000	98.91%	81.55%
2,000	99.63%	88.54%
4,000	99.88%	93.25%
100,000	100.00%	100.00%

Exhibit M-9. Commercial Sector Bill Frequency Analysis



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APPENDIX N: REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS (FY 90/91 CURRENCY)

EEA Sales - Bulk

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1615
AVERAGE (LE/KWH) 1/	0.0840

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
VHV INDUSTRY	3271	0.0435	0.0999	0.0695	60%	0.0695	60%
HV INDUSTRY/AGRI	1218	0.0807	0.1236	0.0860	7%	0.1236	53%
MV INDUSTRY/AGRI	126	0.1355	0.1565	0.1089	-20%	0.1565	16%
DISTRIBUTION COS.	14615	0.0624	0.1249	0.0869	39%	0.0833	33%
TOTAL EEA BULK	19229	0.0608	0.1207	0.0840	38%	0.0840	38%

1/ Approximate revenue requirement for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 0.00% increase.

EDA Sales - Retail

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1780
AVERAGE (LE/KWH) 1/	0.1350

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHNG
LARGE IND/AG/COM	3891	0.1416	0.1565	0.1093	-23%	0.1565	11%
MED. IND/AG/COM	139	0.1202	0.2104	0.1469	22%	0.2104	75%
SMALL IND/AG/COM	1772	0.1261	0.2032	0.1419	13%	0.2032	61%
FREE ZONE - MV	6	0.1264	0.1565	0.1093	-14%	0.1565	24%
FREE ZONE - LV	6	0.1843	0.2003	0.1398	-24%	0.2104	14%
RESIDENTIAL	5602	0.0421	0.2126	0.1485	253%	0.0863	105%
COMMERCIAL	827	0.1083	0.2251	0.1572	45%	0.1572	0.45
STREET LIGHTING	589	0.1855	0.2172	0.1517	-18%	0.2172	17%
SALE FOR RESALE	350	0.0600	0.1228	0.0857	43%	0.1079	80%
TOTAL DC RETAIL	13183	0.0947	0.1934	0.1350	43%	0.1350	43%

1/ Approximate revenue requirement for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 0.00% increase.

APPENDIX O: ELECTRIC GENERATION RELIABILITY: REVIEW AND APPROXIMATIONS

PROBABILITY AND ITS PROPERTIES

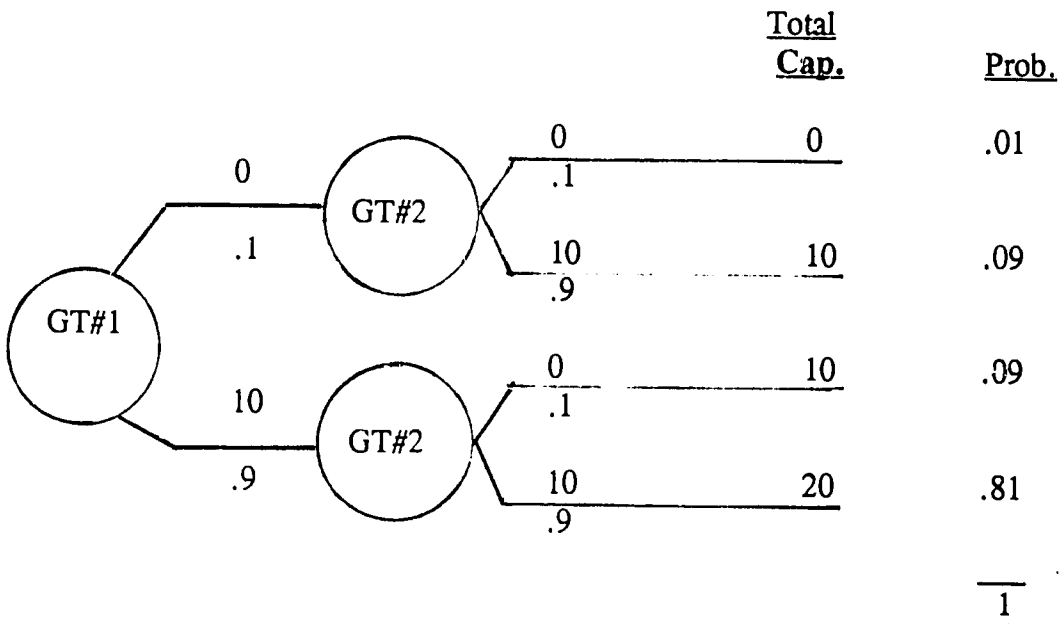
The probability of an event A, P(A), may be thought of as the long-run average frequency that A would occur, in an experiment repeated an infinite number of times. The properties of probability include:

- Its range is 0 to 1 inclusive.
- The sum of the probabilities over any set of "mutually exclusive" (not overlapping) and "collectively exhaustive" (covering all possibilities) events is 1.
- P(A or B) = P(A) + P(B) - P(A and B). If A and B are mutually exclusive (not to be confused with "independent"), then the last term is 0 and P(A or B) is just P(A) + P(B).
- P(A and B) = P(A) P(B given A) = P(B) P(A given B). If A and B are independent, the "givens" can be dropped so that P(A and B) is just P(A) P(B).

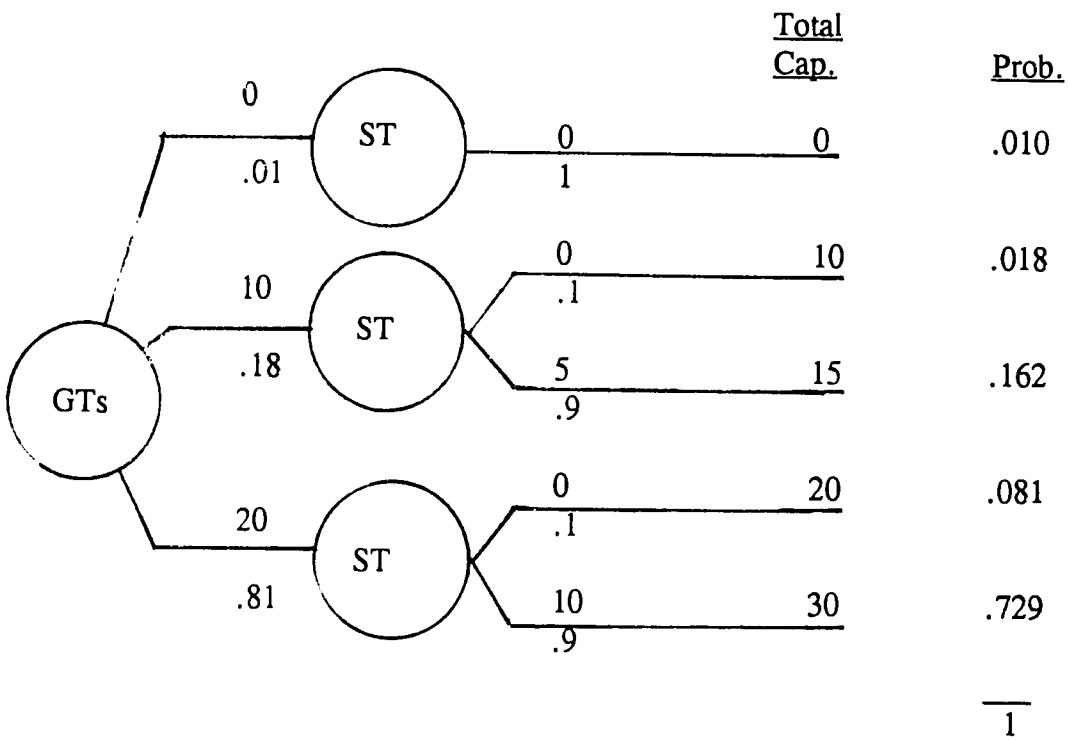
EXAMPLE: RELIABILITY OF A COMBINED-CYCLE POWER PLANT

A particular combined-cycle power plant consists of two gas turbines (GTs) and a steam turbine (ST). The GTs each provide 10 MW of power, with independent forced outage rates (FORs), or failure probabilities, of .1. The ST also provides 10 MW with a .1 FOR, but since it is powered by steam heated by the GTs' exhaust, its output falls to 5 MW if one of the GTs is forced out, and 0 MW if both are forced out. What is the probability distribution of the total plant capacity?

First, find the capacity distribution for the GTs together, with a probability tree:



Then, make a probability tree for the ST capacity given the capacity of the GTs together:



Therefore, the plant has a full FOR of .01 and three partial FORs, as shown above. Note that if all three component units had independent capacities, the full FOR would have been only .001 (.1 x .1 x .1).

EXPECTATION VS. PROBABILITY

A random variable is a variable that can take on different values with associated probabilities. The possible values constitute mutually exclusive, collectively exhaustive events. The expectation, or expected value, of a random variable X, E(X), is the sum (or integral) of these values weighted by their respective probabilities. Properties of expectation include:

- Its range is not restricted in general. (However, if the random variable is always between 0 and 1, e.g., if it is a fraction of time, then expectation must also be between 0 and 1.)

- E(X + Y) = E(X) + E(Y). Compare P(A or B), which may be less than P(A) + P(B).

Any probability can be interpreted as an expectation: the expected number of events, 0 or 1, that would occur in a single trial. For example, P (head on next coin flip) = E (number of heads on next coin flip) = 1/2. But an expectation cannot in general be interpreted as a probability, e.g., if it is not between 0 and 1.

LOSS-OF-LOAD PROBABILITY (LOLP) VS. LOSS-OF-LOAD EXPECTATION (LOLE)

"Loss of load" (LOL) means load in excess of available capacity, resulting in a negative reserve. For one point in time, t:

LOLP = P(LOL at t)

LOLE = E(number of LOL events, 0 or 1, at t).
= LOLP

But over a year (for example):

LOLE = LOLE in hour 1 + ... + LOLE in hour 8760
= LOLP in hour 1 + ... + LOLP in hour 8760
(assuming LOLP is constant in each hour)

What about LOLP over a year? Probabilities such as P (1 or more LOL events over a year) and P (exactly 1 LOL event in a year) are very difficult to calculate because they require

information indicating how long LOL events might last. Unfortunately, the term "LOLP" is often used to refer to annual LOLE, in hours, divided by 8760 hours (resulting in a quantity between 0 and 1). It is possible to interpret this quantity as P (LOL at a randomly selected hour of the year), but it is a good idea to think of this quantity as a scaled LOLE rather than as a probability. Similarly, think of a criterion such as 1 day (24 hours) per year or per 10 years as an LOLE criterion, not an LOLP criterion.

EXPECTED UNSERVED ENERGY

EUE is the expected energy magnitude of LOL, or negative reserve, over a period. In any one hour, this is the expected magnitude of negative reserve in that hour, times 1 hour. Over a year:

$$\begin{aligned} \text{EUE} &= \text{EUE in hour 1} + \ldots + \text{EUE in hour 8760} \\ &= \{ \text{E(LOL in hour 1)} + \ldots + \text{E(LOL in hour 8760)} \} \times 1 \text{ hour.} \end{aligned}$$

EXAMPLE CALCULATION OF LOLP, LOLE, AND EUE

Period:	8760 hours
Generation System:	2 x 10 MW units, each with a 10% FOR
Loads:	15 MW in all hours

First, calculate the distribution of available reserve, by adding each unit to an initialized empty system, and then adding the negative of the loads, treated like a negative-capacity generating unit:

Initialized empty system	=	0 MW with probability 1
+ first unit	=	0 MW with probability .1 10 MW with probability .9
+ second unit	=	0 MW with probability .01 10 MW with probability .18 20 MW with probability .81
+ negative of loads	=	-15 MW with probability .01

-5 MW with probability .18
5 MW with probability .81

Then calculate reliability measures from this distribution:

LOLP = probability of negative reserve (in each hour)
= .01 + .18 = .19

LOLE = expected duration of negative reserve
= (.01 + .18) x 8760 hours = 1664.4 hours

EUE = expected magnitude of negative reserve x period length
= [(.01) 15 MW + (.18) 5 MW] x 8760 hours
= 9198 MWh

APPROXIMATIONS OF RELIABILITY VS. RESERVE FUNCTION

For a generating system with a large number of units, the probability distribution of available reserve typically is somewhat bell-shaped, and the curve around 0 reserve rises almost exponentially (see Figure O-1). This property of the curve allows a simple approximation of LOLE and EUE as a function of added load or capacity. LOLE as a function of added load is the same function as the cumulative distribution of reserve, F(r), because both represent the expected fraction of time that the reserve is less than a given value. A simple approximation of this function in the region around 0 reserve is:

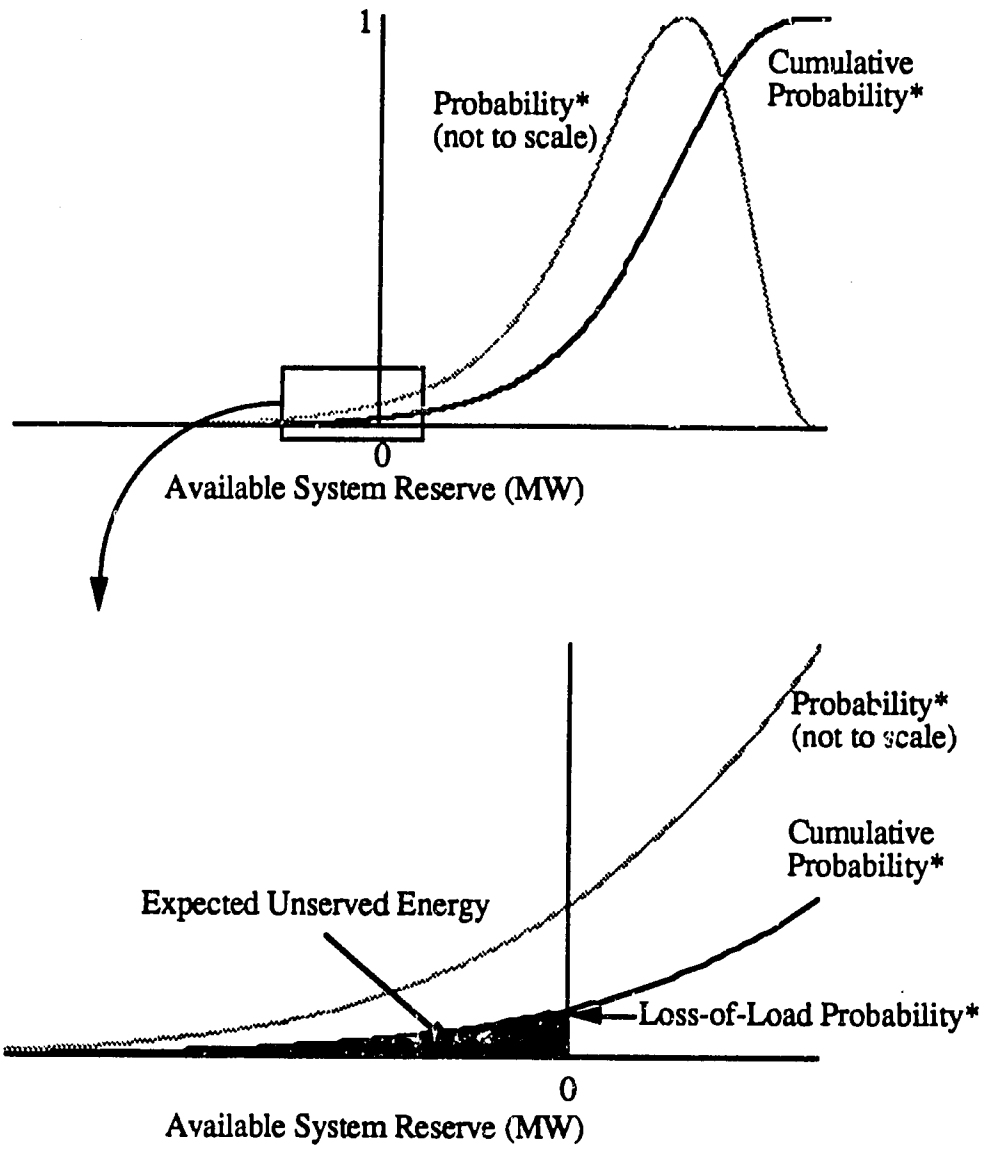
$$F(r) = \text{LOLE} \exp(r/m)$$

where m is a system characteristic, with capacity units such as MW. EUE can be approximated similarly, because it is an integral of LOLE (see Figure O-1), and the integral of an exponential function is still exponential. The parameter m can be estimated from:

$$m = 1 / [\ln F(r)]'$$

where the prime denotes derivative, as you can verify by taking the derivative of ln F(r).

A more accurate approximation of F(r) uses a second system characteristic, "s," in addition to "m" to recognize that F(r) grows more slowly than exponentially:



* For a period rather than a point in time, "probability" becomes "expected fraction of time" and "loss-of-load probability" becomes "loss-of-load expectation".

Figure O-1. Reserve Distribution and Definition of Generation Reliability Measures

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$$F(r) = LOLE \exp[\, r/m - (r/s)^{**}2 \,]$$

Like m, s has capacity units. This approximation can be valid only for:

$$r << s^{**}2 / (2m)$$

because s**2 / (2m) maximizes this approximation, whereas F(r) must be non-decreasing with r. The parameter s can be estimated from:

$$s = \sqrt{-2 / \ln F(r)''}$$

and m can be estimated as before near r=0, as you can verify by taking the first two derivatives of ln F(r).

APPLICATIONS OF APPROXIMATIONS

These approximations can be used to estimate quickly, without a reliability model analysis, quantities such as the load-carrying capability of a generating unit (not discussed here) and the hourly contributions of demand or generation to the total period reliability. Applications of the latter are time-of-use electricity pricing and evaluating time-dependent generation such as solar and wind power. Though the first approximation is adequate for estimating load-carrying capability, the greater accuracy of the second is worthwhile for estimating hourly LOLE. An example comparison is shown below, for m = 100 MW and s = 500 MW.

		. .LOLE Relative to Peak LOLE. . .	
Load	r = load-peak	Simple Approx.	Improved Approx.
5000	0	1	1
4900	-100	.368	.353
4500	-500	.00474	.00248

APPENDIX P: GENERATING UNIT DATA AND PEAK LOAD, FISCAL YEAR 1994-1995, AND HYDRO AVAILABLE CAPACITY MODEL

Plant	Un-its	F.O.R.	Partial Cap.(MW)	Unit Cap.(MW)
Cairo West (st)	4	0.08		75
Cairo South (st)	4	0.08		55
Cairo North (st)	2	0.08		25
El Tebbin (st)	3	0.08		13
New Talkha (st)	3	0.08		25
Old Talkha (st)	3	0.08		10
New Damanhour (st)	3	0.08		40
Old Damanhour (st)	2	0.08		0
Kafr El Dawar (st)	4	0.08		80
Suif (st)	4	0.08		23
Suez (st)	4	0.08		20
Assiut (st)	3	0.08		24
Abu Kir (st)	4	0.08		140
Abu Soltan (st)	4	0.08		140
Shoubrah (st)	4	0.08		300
Attaka (st)	2	0.08		140
Helwan (gt)	5	0.11		20
El Tebbin (gt)	2	0.11		20
Cairo East (gt)	2	0.11		18
Ismailia (gt)	1	0.11		16
Port Said (gt)	2	0.11		16
Mahmoudia 1 (gt)	8	0.11		0
Mahmoudia 2 (gt)	4	0.11		36
Shabab (gt)	3	0.11		25
Suif (gt)	7	0.11		22
Damanhour (gt)	4	0.11		0
Wadi Hof (gt)	3	0.11		27
Demietta (gt)	6	0.11		0
Cairo South (gt)	2	0.11		100
Talkha (cc)	2	0.00043		130
partial cap. state		0.008	40	
partial cap. state		0.073	60	
partial cap. state		0.33	80	

Hydro Model (hy)	1	0		2745
partial cap. state		0.00114	1345	
partial cap. state		0.01	1545	
partial cap. state		0.00907	1745	
partial cap. state		0.03014	1945	
partial cap. state		0.04965	2145	
partial cap. state		0.0063	2345	
partial cap. state		0.0963	2545	
1989-90: Suez (gt)	1	0.11		90
1989-90: Damanhour 4 (st)	1	0.08		270
1989-90: Attaka 3 (st)	1	0.08		270
1989-90: Cairo S. 3 (st)	1	0.08		100
1990-1: Heliopolis4+5(gt)	2	0.11		10
1990-1: Talkha 4 (st)	1	0.08		200
1990-1: Demietta conv(cc)	3	0.012		350
partial cap. state		0.012	120	
partial cap. state		0.184	175	
partial cap. state		0.048	240	
1990-1: Abu Kir 5 (st)	1	0.08		270
1991-2: Cairo S. 3 (gt)	1	0.11		0
1991-2: Assiut 4 (st)	1	0.08		270
1992-3: Talkha 5 (st)	1	0.08		200
1992-3: Cairo S. conv. (c	1	0.11		155
partial cap. state		0.053	105	
1992-3: Cairo West 5 (st)	1	0.08		270
1993-4:Damanhour conv(cc)	1	0.00043		120
partial cap. state		0.008	40	
partial cap. state		0.073	60	
partial cap. state		0.33	80	
1993-4:Mahmoudia conv(cc)	2	0.00043		120
partial cap. state		0.008	40	
partial cap. state		0.073	60	
partial cap. state		0.33	80	
1993-4: Cairo West 6 (st)	1	0.08		270
1994-5: Assiut 5 (st)	1	0.08		270
1994-5: Ayun Mousa 1(cst)	1	0.12		270
1994-5: Sidi Krir 1 (st)	1	0.08		270
Total				12486
Expected Peak Load (MW)				9225
Reserve Margin (%)				35.35%

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HYDRO AVAILABLE CAPACITY MODEL

The available capacity of the hydro system cannot be modeled unit-by-unit because common hydrologic conditions induce dependence among the unit available capacities. These conditions limit the maximum capacity available from each of the High Dam units. Forced outage rates then limit the mechanical availability of this capacity.

Section 9.1 gave a five-state probability distribution on hydrologic availability of the High Dam units. Mechanical availability is then described by a .01 probability of failure, independently for each unit. The Aswan Dam units are assumed to be subject to mechanical availability only. Therefore, they could be modeled unit-by-unit as usual, but they are included in the hydro model to keep all the hydro capacity together.

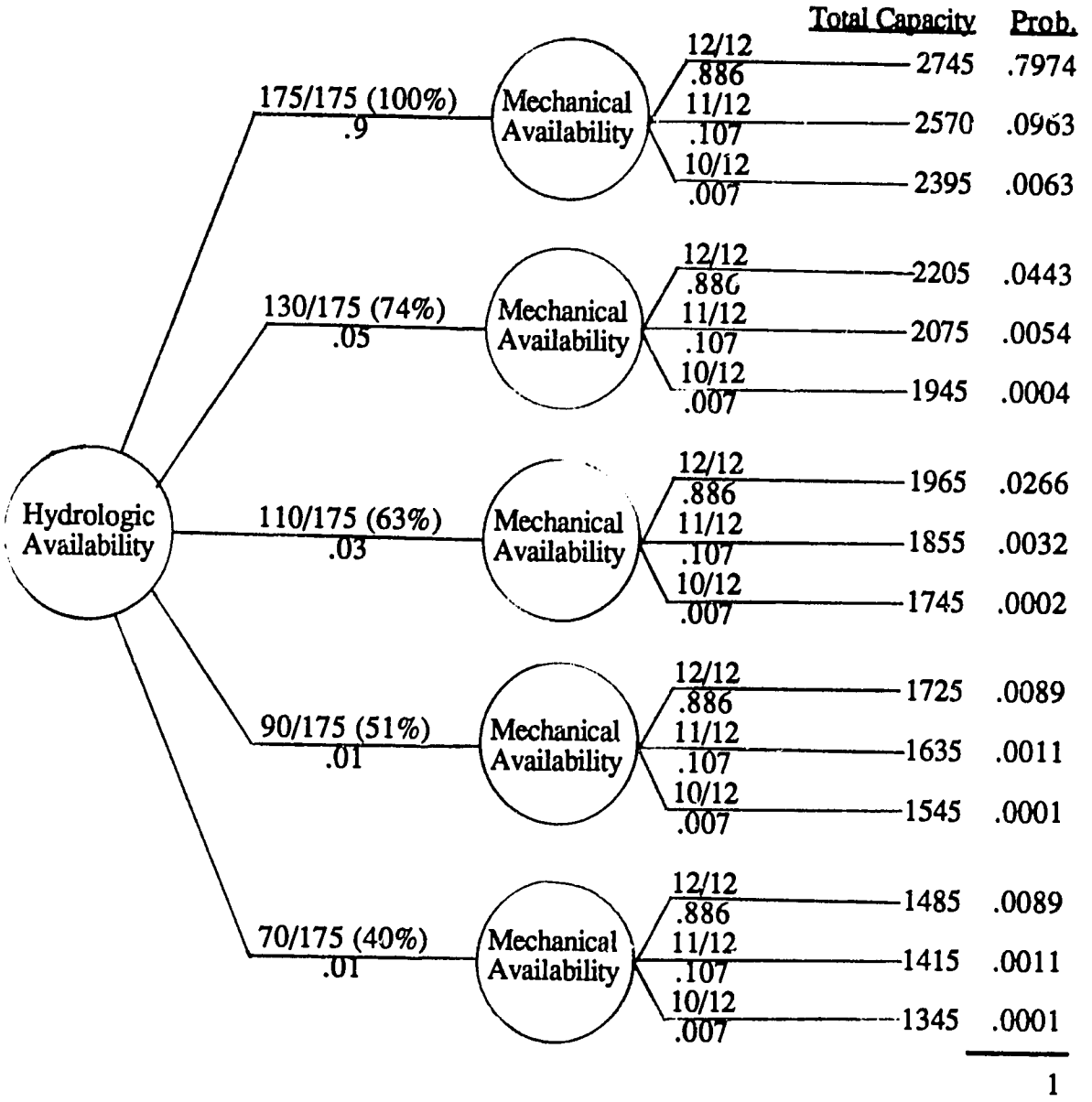
The problem is to determine the probability distribution on available hydro system capacity, taking into account limitations on both hydrologic and mechanical availability. The dependence induced by common hydrologic conditions necessitates a probability tree -- with branches for each hydrologic availability case, each holding branches for each mechanical availability case. However, considering just the 12 High Dam units, the full probability tree would be unwieldy, with 65 branches (for 5 hydrologic cases times 13 mechanical cases: 0 to 12 working units).

Fortunately, the very small hydro unit forced outage rate allows the tree to be approximated accurately with just 5 times 3, or 15 branches. This is possible because only the probabilities of all 12, 11 of 12, and 10 of 12 units working are significant. These probabilities can be calculated from the Binomial probability distribution for the number of successes out of 12 trials:

P (all 12 units work) = $.99^{12} \approx .886$
P (11 of 12 units work) = $12.99^{11}\ .01 \approx .107$
P (10 of 12 units work) = $(12 \times 11 / 2).99^{10}\ .01^2 \approx .006$
P (10 or fewer units work) = 1 - P (all 12 units work) - P (11 of 12 units work) $\approx .007$.

Similarly, an approximate probability distribution could be calculated for the total Aswan Dam capacity, though the Binomial distribution is not usable because the units have different sizes. However, with 13 individual Aswan Dam units, the probability of losing a significant fraction of the total capacity is negligible, and it is reasonable to assume that the rated capacity is available. The 15-branch probability tree for available hydro capacity therefore has outcomes decreasing from 2,745 MW (645 MW from the Aswan Dam units plus 12 x 175 MW from the High Dam units) as shown on the next page.

This 15-state model is still more detailed than necessary, so it was further disaggregated to 8 states, decreasing in 200 MW steps from maximum capacity of 2,745 MW. The result was shown earlier in this appendix.


Total Capacity
Prob.
Hydrologic Availability
175/175 (100%)
.9
130/175 (74%)
.05
110/175 (63%)
.03
90/175 (51%)
.01
70/175 (40%)
.01
Mechanical Availability
12/12
.886
11/12
.107
10/12
.007
2745 .7974
2570 .0963
2395 .0063
2205 .0443
2075 .0054
1945 .0004
1965 .0266
1855 .0032
1745 .0002
1725 .0089
1635 .0011
1545 .0001
1485 .0089
1415 .0011
1345 .0001
1

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APPENDIX Q: SUPPORTING TABLES FOR SECTION 9.2

Exhibit Q-1

DATA ON THE GENERATING SYSTEM USED IN THE COMPUTATION OF THE INCREMENTAL OPERATING COST BY TIME OF DAY

PLANT	NUMBER OF UNITS	INSTALLED CAPACITY MW	NET CAPACITY MW (*)	FORCED OUTAGE RATE	FUEL COST $/MWH	VARIABLE O&M COST $/MWH	DAYS IN MAINTENANCE
THERMAL PLANTS							
cairo we st	4	350	327	11.4%	19.65	0.20	28
cairo so st	4	255	238	4.0%	25.36	0.20	28
cairo no st	2	100	94	30.6%	27.71	0.20	28
el tebbin s	3	45	42	26.6%	27.27	0.20	28
new talkha s	3	90	84	23.6%	26.53	0.20	28
old talkha s	3	38	36	23.6%	26.53	0.20	28
new daman s	3	195	182	53.8%	21.70	0.20	28
old daman s	2	30	28	53.8%	21.70	0.20	28
kafra (st)	4	440	411	24.2%	19.79	0.20	28
suif (st)	4	113	106	51.0%	22.06	0.20	28
suez (st)	4	100	94	67.2%	22.06	0.20	28
assiut (st)	3	90	84	8.4%	21.45	0.20	28
abu kir (st)	4	600	561	18.4%	16.79	0.20	28
abu solta s	4	600	561	16.4%	16.49	0.20	28
shoubrah st	4	1296	1211	4.8%	17.08	0.20	28
attaka (st)	2	600	561	18.6%	14.73	0.20	28
daman 4 (st)	1	300	280	8.0%	17.00	0.20	28
cairo so 3 s	1	100	94	8.0%	19.00	0.20	28
attaka 3 st	1	300	280	8.0%	17.00	0.20	28
suez 5 st	1	90	84	8.0%	19.00	0.20	28
talkha 4 s	1	200	187	8.0%	18.00	0.20	28
abu kir 5 s	1	300	280	8.0%	17.00	0.20	28
talkha (cc)	2	260	252	10.0%	17.00	0.20	14
demietta cc	6	1050	1019	10.0%	17.00	0.20	14
helwan (gt)	5	100	99	8.8%	28.22	0.20	14
el tebbin g	2	46	45	29.2%	30.35	0.20	14
cairo ea gt	2	46	45	28.0%	27.64	0.20	14
ismailia g	1	20	19	3.0%	51.70	0.20	14
port said gt	2	60	59	4.6%	26.24	0.20	14
mahmoudia g	12	392	388	7.2%	26.17	0.20	14
shabab (gt)	3	100	99	16.2%	25.95	0.20	14
suif (gt)	7	225	223	21.0%	30.13	0.20	14
damanhour gt	4	100	99	1.4%	24.78	0.20	14
wadi hof gt	3	100	99	6.0%	30.35	0.20	14
cairo so 3 g	2	100	99	11.0%	25.00	0.20	14
heliop 4+5 g	2	20	19	11.0%	25.05	0.20	14
assiut 4 st	1	300	280	8.0%	17.00	0.20	28
HYDROELECTRIC PLANTS							
aswan I	9	345	100	1.0%	0.00	0.01	20
aswan II	4	300	100	1.0%	0.00	0.01	20
high dam	12	2100	0	1.0%	0.00	0.01	20

(*) For hydro plants this columns corresponds to minimum power output

Exhibit Q-2

AVERAGE HOURLY LOADS FOR THE WORKING DAYS OF EACH MONTH USED IN THE COMPUTATION OF INCREMENTAL OPERATING COST BY TIME-OF-DAY

HOURLY LOADS FOR WORKING DAYS IN MW

MONTH	YEAR	HOUR	1	2	3	4	5	6	7	8	9	10	11	12	PEAK LOAD MW	BASE LOAD MW	ENERGY DEMAND MWH	NO. OF DAYS
JULY	1991	AM	4150	3918	3803	3733	3651	3550	3565	3873	4164	4309	4364	4459				
		PM	4490	4360	4303	4354	4395	4465	5023	5714	5644	5376	5103	4726	5714	3550	105494	26
AUGUST	1991	AM	4188	3932	3799	3762	3691	3606	3571	3802	4065	4179	4269	4369				
		PM	4420	4248	4230	4257	4252	4389	5369	5690	5530	5259	5008	4656	5690	3571	104540	27
SEPTEMB	1991	AM	4120	3914	3807	3754	3739	3718	3701	3882	4121	4247	4302	4421				
		PM	4469	4278	4255	4305	4327	4856	5786	5766	5517	5274	4953	4597	5786	3701	106105	26
OCTOBER	1991	AM	3930	3729	3641	3610	3647	3743	3805	3870	4009	4083	4174	4218				
		PM	4198	4131	4108	4168	4339	5615	5758	5648	5381	5057	4789	4304	5758	3610	103952	26
NOVEMBE	1991	AM	3850	3689	3577	3573	3645	3869	4004	4013	4112	4141	4170	4189				
		PM	4171	4086	4098	4235	4731	5756	5781	5663	5438	5074	4701	4277	5781	3573	104843	26
DECEMBE	1991	AM	3887	3706	3614	3573	3652	3917	4182	4188	4247	4274	4264	4296				
		PM	4297	4208	4203	4353	4934	5830	5825	5630	5447	5118	4774	4345	5830	3573	106763	27
JANUARY	1992	AM	3801	3604	3503	3482	3544	3753	4058	4142	4255	4267	4211	4269				
		PM	4267	4143	4194	4328	4579	5655	5712	5589	5447	5128	4758	4362	5712	3482	105049	26
FEBRUAR	1992	AM	3783	3587	3505	3469	3557	3775	4093	4080	4213	4212	4190	4149				
		PM	4272	4154	4151	4287	4426	5354	5727	5628	5514	5195	4815	4361	5727	3469	104497	25
MARCH	1992	AM	3936	3672	3569	3543	3645	3825	3993	4059	4170	4115	4099	4160				
		PM	4241	4134	4134	4196	4287	4889	5757	5707	5528	5231	4877	4503	5757	3543	104269	27
APRIL	1992	AM	4342	4110	4003	3816	3662	3614	3605	3796	3971	4045	4000	4127				
		PM	4139	4076	4060	4157	4138	4467	5418	5682	5592	5399	5137	4822	5682	3605	104179	25
MAY	1992	AM	3865	3642	3524	3499	3557	3740	4005	4078	4149	4252	4178	4233				
		PM	4133	4178	4119	4185	4199	4233	4573	5359	5575	5448	5288	5097	5575	3499	103108	27
JUNE	1992	AM	4330	3963	3812	3769	3746	3696	3621	3892	4201	4328	4401	4448				
		PM	4479	4354	4323	4367	4363	4356	4347	4984	5612	5472	5256	4962	5612	3621	105082	26

Exhibit Q-3

AVERGAE HOURLY LOAD FOR THE FRIDAYS
OF EACH MONTH USED IN THE COMPUTATION
OF INCREMNTAL OPERATING COST BY TIME-OF-DAY

HOURLY LOADS FOR FRIDAYS IN MW

MONTH	YEAR	HOUR	1	2	3	4	5	6	7	8	9	10	11	12	PEAK LOAD MW	BASE LOAD MW	ENERGY DEMAND MWH	NO. OF DAYS
JULY	1991	AM	4358	3994	3858	3757	3706	3561	3548	3580	3716	3838	4010	4044				
		PM	3961	4033	4054	4064	4055	4213	4662	5532	5477	5192	5012	4549	5532	3548	100775	5
AUGUST	1991	AM	4213	3929	3847	3731	3718	3499	3486	3548	3669	3865	3978	3985				
		PM	3946	3976	3951	4005	3995	4119	5235	5532	5370	5062	4842	4545	5532	3486	100042	4
SEPTEMB	1991	AM	4274	3986	3844	3781	3749	3626	3544	3569	3739	3824	3922	3945				
		PM	3974	4005	3934	3990	4024	4543	5530	5539	5359	5066	4789	4443	5539	3544	100990	4
OCTOBER	1991	AM	3990	3731	3657	3609	3624	3601	3550	3539	3700	3795	3934	3869				
		PM	3862	3842	3865	3908	4001	4907	5489	5354	5197	4894	4521	4079	5489	3539	98520	5
NOVEMBE	1991	AM	3967	3755	3608	3664	3718	3769	3771	3802	3956	4023	4097	4018				
		PM	4006	4004	3948	4046	4578	5587	5548	5438	5282	4934	4531	4140	5587	3608	102187	4
DECEMBE	1991	AM	4076	3762	3635	3579	3592	3764	3806	3823	3936	4069	4103	4061				
		PM	4010	4026	4060	4104	4509	5663	5571	5398	5278	4909	4547	4184	5663	3579	102461	4
JANUARY	1992	AM	4040	3820	3643	3575	3586	3697	3765	3790	3891	4192	4262	4008				
		PM	3869	3974	3925	4007	4251	5434	5535	5426	5305	4692	4663	4252	5535	3575	101604	5
FEBRUAR	1992	AM	4104	3786	3649	3584	3625	3763	3787	3845	4013	4093	4147	4172				
		PM	3966	4004	3968	4003	4419	5258	5540	5473	5358	5088	4772	4258	5540	3584	102670	4
MARCH	1992	AM	4105	3761	3683	3615	3721	3714	3673	3731	3892	4034	4118	4080				
		PM	3913	3887	3951	3948	4055	4565	5532	5452	5343	5057	4664	4258	5532	3615	100751	4
APRIL	1992	AM	4456	4247	4063	3898	3659	3615	3510	3594	3794	3901	4008	4013				
		PM	3930	3974	4009	4014	4031	4334	5331	5560	5451	5310	5010	4658	5560	3510	102372	5
MAY	1992	AM	3922	3519	3536	3479	3503	3770	4046	4136	4266	4275	4245	4182				
		PM	3903	3921	3971	3993	3957	3913	4354	5203	5013	5387	5211	4983	5387	3479	100785	4
JUNE	1992	AM	4545	4068	3872	3808	3791	3699	3516	3508	3576	3815	4001	4070				
		PM	4036	3913	3915	4012	4056	4040	4003	4390	5457	5324	5122	4842	5457	3508	99375	4

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Exhibit Q-4

Incremental Fuel Costs by Hour and Day Type ($/MWh)

MONTH	DAY	HOUR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
January	Weekday	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.21	18.97	18.85	18.22	18.13	18.20
January	Friday	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	17.44	18.01	17.97	17.64	17.48	17.44
February	Weekday	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.08	18.10	17.95	17.98	18.00	18.00
February	Friday	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.52	17.81	18.38	18.13	17.55	17.52	17.52
March	Weekday	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.54	18.95	18.84	18.54	18.54	18.54	18.54
March	Friday	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.35	20.40	20.40	20.35	20.35	20.35	20.35
April	Weekday	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.79	18.84	19.01	18.87	18.79	18.79	18.79	18.79
April	Friday	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.48	17.50	17.48	17.48	17.48	17.48	17.48
May	Weekday	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.55	19.31	19.12	19.56	19.55	19.55	19.55	19.55
May	Friday	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84	17.84
June	Weekday	19.48	19.48	19.44	19.41	19.47	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.48	19.51	19.51	19.48	19.48	19.48	19.48	19.48
June	Friday	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.45	19.51	19.45	19.45	19.45	19.45	19.45	19.45
July	Weekday	18.59	18.15	18.01	17.98	18.08	18.48	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66
July	Friday	19.32	19.32	19.30	19.18	19.19	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32	19.32
August	Weekday	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	18.47	19.03	18.72	18.50	18.47	18.47	18.47
August	Friday	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.04	18.16	18.06	18.04	18.04	18.04	18.04
September	Weekday	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	18.52	19.58	19.41	18.93	18.52	18.52	18.52
September	Friday	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.61	17.99	17.85	17.71	17.61	17.61	17.61
October	Weekday	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.39	19.59	20.31	19.98	19.59	19.39	19.39
October	Friday	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.03	18.22	18.56	18.43	18.17	18.03	18.03
November	Weekday	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.15	18.90	19.73	19.30	18.60	18.31
November	Friday	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	18.80	19.16	18.86	19.35	19.17	18.86
December	Weekday	17.41	17.42	17.42	17.42	17.42	17.42	17.42	17.42	17.42	17.41	17.29	17.31	17.32	17.35	17.43	17.32	17.33	17.34	17.37	17.42	17.79	17.79	17.59	17.41
December	Friday	17.55	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.31	17.41	19.05	18.75	18.38	17.93

May 16, 1991

Exhibit Q-5

Costs of Losses by Hour and Day Type ($/MWh)

MONTH	DAY	HOUR 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
January	Weekday	2.52	2.38	2.31	2.26	2.21	2.15	2.16	2.35	2.53	2.61	2.65	2.71	2.72	2.65	2.61	2.64	2.67	2.71	3.05	3.61	3.55	3.26	3.08	2.87
January	Friday	2.53	2.32	2.24	2.18	2.15	2.07	2.06	2.08	2.16	2.23	2.33	2.35	2.30	2.34	2.35	2.36	2.36	2.45	2.71	3.32	3.28	3.05	2.92	2.[illegible]4
February	Weekday	2.51	2.36	2.28	2.26	2.21	2.16	2.14	2.28	2.44	2.51	2.56	2.62	2.65	2.55	2.54	2.55	2.55	2.63	3.24	3.43	3.31	3.15	3.00	2.79
February	Friday	2.46	2.29	2.25	2.18	2.17	2.04	2.04	2.07	2.14	2.26	2.32	2.33	2.30	2.32	2.31	2.34	2.33	2.41	3.11	3.39	3.24	2.96	2.83	2.65
March	Weekday	2.55	2.42	2.35	2.32	2.31	2.30	2.29	2.40	2.55	2.62	2.66	2.73	2.76	2.64	2.63	2.66	2.67	3.00	3.65	3.62	3.41	3.26	3.06	2.84
March	Friday	2.90	2.70	2.61	2.56	2.54	2.46	2.40	2.42	2.54	2.59	2.66	2.68	2.70	2.72	2.67	2.71	2.73	3.08	3.76	3.77	3.64	3.44	3.25	3.01
April	Weekday	2.46	2.34	2.28	2.26	2.28	2.34	2.38	2.42	2.51	2.56	2.61	2.64	2.63	2.59	2.57	2.61	2.72	3.53	3.65	3.55	3.37	3.17	3.00	2.70
April	Friday	2.32	2.17	2.13	2.10	2.11	2.10	2.07	2.06	2.16	2.21	2.29	2.25	2.25	2.24	2.25	2.28	2.33	2.86	3.20	3.12	3.03	2.85	2.63	2.38
May	Weekday	2.51	2.40	2.33	2.33	2.38	2.52	2.61	2.62	2.68	2.70	2.72	2.73	2.72	2.66	2.67	2.76	3.08	3.70	3.68	3.69	3.54	3.31	3.06	2.79
May	Friday	2.36	2.23	2.15	2.18	2.21	2.24	2.24	2.26	2.35	2.39	2.44	2.39	2.38	2.38	2.35	2.41	2.72	3.32	3.30	3.23	3.14	2.93	2.69	2.46
June	Weekday	2.52	2.41	2.34	2.31	2.37	2.54	2.72	2.72	2.76	2.78	2.77	2.79	2.79	2.73	2.73	2.83	3.20	3.79	3.79	3.65	3.54	3.32	3.10	2.82
June	Friday	2.64	2.44	2.36	2.32	2.33	2.44	2.47	2.48	2.55	2.64	2.66	2.63	2.60	2.61	2.63	2.66	2.92	3.68	3.61	3.50	3.42	3.18	2.95	2.71
July	Weekday	2.36	2.18	2.10	2.09	2.14	2.31	2.52	2.58	2.65	2.65	2.62	2.66	2.65	2.58	2.61	2.69	2.85	3.52	3.55	3.48	3.39	3.19	2.96	2.71
July	Friday	2.60	2.46	2.34	2.29	2.29	2.38	2.42	2.44	2.51	2.70	2.74	2.58	2.49	2.56	2.53	2.58	2.74	3.50	3.56	3.49	3.42	3.02	3.00	2.74
August	Weekday	2.33	2.21	2.16	2.14	2.19	2.32	2.52	2.51	2.59	2.59	2.58	2.55	2.63	2.56	2.56	2.64	2.72	3.30	3.63	3.51	3.40	3.20	2.96	2.68
August	Friday	2.47	2.28	2.19	2.16	2.18	2.26	2.28	2.31	2.41	2.46	2.49	2.51	2.38	2.41	2.39	2.41	2.66	3.16	3.35	3.29	3.22	3.06	2.87	2.56
September	Weekday	2.43	2.27	2.20	2.19	2.25	2.36	2.47	2.51	2.57	2.54	2.53	2.57	2.62	2.55	2.55	2.59	2.65	3.02	3.76	3.69	3.49	3.23	3.01	2.78
September	Friday	2.41	2.21	2.16	2.12	2.18	2.18	2.16	2.19	2.28	2.37	2.42	2.39	2.30	2.28	2.32	2.32	2.38	2.68	3.32	3.24	3.15	2.97	2.74	2.50
October	Weekday	2.81	2.66	2.59	2.47	2.37	2.34	2.33	2.45	2.57	2.61	2.59	2.67	2.68	2.65	2.62	2.69	2.67	2.89	3.54	3.85	3.73	3.53	3.32	3.12
October	Friday	2.68	2.55	2.44	2.34	2.20	2.17	2.11	2.16	2.28	2.34	2.41	2.41	2.36	2.39	2.41	2.41	2.42	2.60	3.24	3.44	3.35	3.22	3.01	2.80
November	Weekday	2.34	2.20	2.13	2.12	2.15	2.26	2.42	2.47	2.51	2.57	2.53	2.55	2.50	2.53	2.49	2.53	2.54	2.56	2.77	3.38	3.67	3.51	3.28	3.11
November	Friday	2.46	2.27	2.22	2.18	2.20	2.36	2.54	2.59	2.67	2.68	2.66	2.62	2.45	2.46	2.49	2.50	2.48	2.45	2.73	3.32	3.15	3.47	3.33	3.13
December	Weekday	2.51	2.30	2.21	2.19	2.18	2.15	2.10	2.26	2.44	2.51	2.54	2.57	2.59	2.52	2.51	2.52	2.52	2.52	2.52	2.89	3.33	3.25	3.08	2.88
December	Friday	2.66	2.35	2.23	2.20	2.19	2.13	2.03	2.02	2.06	2.20	2.31	2.35	2.33	2.26	2.26	2.31	2.34	2.33	2.31	2.55	3.47	3.33	3.14	2.89

May 16, 1991

Exhibit Q-6

Costs of Unserved Energy by Hour and Day Type ($/MWh)

		HOUR																							
MONTH	DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
January	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
January	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
April	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
April	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
July	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	Weekday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	Friday	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX R: FINANCIAL MODEL RESULTS UNDER LRMC-BASED TARGET YIELDS (CASES EEA-YLR2V, EDA-YLR2V)

EGYPTIAN ELECTRICITY SYSTEM

TABULATION OF KEY RESULTS

Date: 17-Sep
EEA FILE EEAYLR2
EDA FILE EDAYLR2

Year end June 30	Est. 1991	Forecast 1992	1993	1994	1995	1996
1 Border Price -- Mazout -- $/Tonne	70.1	64.7	74.7	84.2	86.7	90.5
LE/Tonne	231.4	279.0	369.0	450.6	482.2	511.1
2 Exchange Rate	3.300	4.310	4.940	5.350	5.560	5.650
3 Mazout Transfer Price to EEA						
--LE/Tonne	55.0	83.7	184.5	283.9	385.7	511.1
4 Gas Transfer Price tc EEA						
--LE/Tonne	66.0	98.3	184.5	283.9	385.7	511.1
5 Mazout price to EEA as % Mazout Border Price	23.8%	30.0%	50.0%	63.0%	80.0%	100.0%
Gas price to EEA as % Mazout Border Price	28.5%	35.2%	50.0%	63.0%	80.0%	100.0%
6 Target Self-finacing Ratio (WB) - %	0.0%	20.0%	30.0%	35.0%	35.0%	35.0%
7 Self-financing Ratio -- WB Definition	-32.9%	-39.2%	-3.5%	-3.4%	-8.6%	-28.4%
-- HCG Definition	-11.0%	-29.6%	7.6%	9.6%	5.1%	-14.0%
8 Revenue Requirement for Above Assumptions (Milliemes / kwh)						
-- EEA Requirement	43.1	59.5	99.9	133.3	163.4	192.4
-- EDA Requirement	70.2	91.4	153.4	207.5	256.4	303.3
-- System Requirement	61.6	81.2	141.7	188.8	231.6	272.7
9 % Real Increase Required						
-- EEA		38.2%	67.9%	33.4%	22.6%	17.7%
-- EDA		30.1%	67.8%	35.3%	23.6%	18.3%
-- System		31.9%	74.4%	33.3%	22.6%	17.7%

case # EEAYLR2

EGYPTIAN ELECTRICITY AUTHORITY

INPUT ASSUMPTIONS

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1	1.350	2.310	2.599	2.750	Exchange Rate -- L.E./US$	3.300	4.310	4.940	5.350	5.560	5.650
2				3.70%	Inflation Rate -- International %	8.70%	6.20%	2.20%	1.70%	2.50%	3.10%
3				15.00%	-- Egyptian %	20.00%	20.00%	15.00%	9.00%	6.00%	5.00%
4			0.8868	0.9200	Inflation Index -- International	1.0000	1.0620	1.0854	1.1038	1.1314	1.1665
5			0.7246	0.8333	Inflation Index -- Egyptian	1.0000	1.2000	1.3800	1.5042	1.5945	1.6742
6	4.00%	4.31%	4.53%	4.08%	Station Losses -- %	4.10%	4.10%	4.10%	4.10%	4.10%	4.10%
7	7.64%	7.72%	7.16%	6.31%	System Losses -- %	6.16%	5.86%	5.33%	5.00%	4.80%	4.44%
8					International Fuel Prices ($/MBTU) --						
9			4.69	4.69	-- Distillate	4.14	3.93	4.18	4.37	4.51	4.71
10			2.43	2.43	-- Residual	1.69	1.56	1.80	2.03	2.09	2.18
11			2.43	2.43	-- Natural Gas	1.69	1.56	1.80	2.03	2.09	2.18
12			1.80	1.80	-- Coal	1.80	1.80	1.80	1.80	1.80	1.80
13					* IF INFLATION IS TO BE PUT INTO *	******* *					
14					* FORECAST, INSERT "1" HERE >>>>>>	1	<<<<<< OTHERWISE, SET AT "0"				
15						******* *					
16					Interest Rate on New FX Loans -%	7.00%	*******	*******	*******	*******	*******
17					Interest Rate on New EL Loans -%	11.25%	*******	*******	*******	*******	*******
18	5.0%	3.3%	3.7%	3.5%	Depreciation Expense Rate %	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
19	136	151	168	167	Customer Accts Rec. -- days' sales	160	110	90	90	90	90
20	149	102	110	83	Other Accts Rec. -- days' sales	48	30	16	11	9	7
21	6.4%	5.9%	7.0%	6.3%	Inventories -- % of G F A	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
22					TARGET SELF-FINANCING RATIO % (WB)		20.0%	30.0%	35.0%	35.0%	35.0%
23					EEA Fuel Price as % Int'l Price	26.8%	43.8%	50.0%	63.0%	80.0%	100.0%

case # EEAYLR2

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED INCOME STATEMENT
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1											
2	35202	37847	39583	41649	Gross Generation(Gwh)	44297	47201	49947	52921	56155	59311
3	33794	36216	37790	39950	Net Energy Sent Out(Gwh)	42481	45266	47899	50751	53852	56879
4	31212	33420	35084	37429	Net Energy Sold(Gwh)	39864	42612	45346	48213	51267	54352
5	16.4	22.0	24.0	30.5	Average Tariff (Millimes/Kwh)	43.1	59.5	99.9	133.3	163.4	192.4
6											
7											
8											
9					OPERATING REVENUE						
10	513.2	734.9	840.4	1,142.9	Sales of Electricity	1,716.8	2,535.4	4,530.1	6,426.8	8,377.1	10,457.3
11	0.2	0.4	0.9	0.9	Other operating Revenue						
12											
13	513.5	735.3	841.3	1,143.8	TOTAL OPERATING REVENUE	1,716.8	2,535.4	4,530.1	6,426.8	8,377.1	10,457.3
14											
15					OPERATING EXPENSES						
16	147.5	256.1	265.9	330.8	Fuel @ Base Year	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
17					Inflation			792.3	1,511.1	2,412.7	3,660.8
18					Total	552.8	904.2	2,060.4	3,425.0	5,074.9	7,332.0
19		0.7	0.4	1.6	Purchases from Sales @ Base Year	1.5	1.5	1.5	1.5	1.5	1.5
20					Inflation	(0.0)	0.3	0.6	0.8	0.9	1.0
21					Total	1.5	1.9	2.1	2.3	2.5	2.6
22	48.3	58.1	69.5	82.3	Salaries & Wages (Operation only)	90.7	93.3	100.5	105.0	111.0	116.0
23					Inflation	(0.0)	18.7	38.2	52.9	66.0	78.2
24					Total	90.7	111.9	138.7	157.9	177.0	194.2
25	80.6	62.1	112.0	138.2	Materials & Services Input	158.3	164.0	178.1	187.0	199.4	208.4
26					Inflation	(0.0)	32.8	67.7	94.3	118.5	140.5
27					Total	158.3	196.8	245.7	281.3	317.9	348.9
28	38.2	42.7	52.1	60.9	Other Operating Expenses(Admin)	67.1	71.3	75.9	80.8	86.1	90.3
29					Inflation	(0.0)	14.3	28.8	40.7	51.2	60.9
30					Total	67.1	85.6	104.7	121.5	137.3	151.1
31	152.8	133.1	180.3	243.2	Depreciation -- Historical	253.3	282.9	338.2	425.8	540.2	671.0
32					-- Revaluation	285.8	446.6	721.6	897.0	1,026.0	1,124.0
33	152.8	133.1	180.3	243.2	Total	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
34											
35	467.3	552.8	680.3	857.0	TOTAL OPERATING EXPENSES	1,409.5	2,029.9	3,611.6	5,310.9	7,275.8	9,823.8
36											
37											
38	46.2	182.5	161.1	286.8	INCOME FROM OPERATIONS	307.3	505.5	918.5	1,115.9	1,101.3	633.4
39											
40	148.7	247.1	284.3	432.1	Gross Interest	580.6	880.7	1,340.8	1,836.5	2,287.0	2,688.0
41	34.5	76.0	116.3	168.9	Interest During Construction	121.0	211.1	508.0	708.6	764.7	701.2
42											
43	114.2	171.1	168.1	263.2	NET INTEREST EXPENSE	459.7	669.6	832.8	1,127.9	1,522.3	1,986.8
44											
45											
46	(68.0)	11.5	(7.0)	23.6	NET OPERATING INCOME	(152.4)	(164.0)	85.6	(12.0)	(421.1)	(1,353.4)
47											
48	103.1	51.0	82.4	88.4	Non-Operating Income	85.0	85.0	85.0	85.0	85.0	85.0
49	22.0	49.1	51.4	87.9	Less:Non-operating Expenses	75.0	75.0	75.0	75.0	75.0	75.0
50											
51	81.1	2.0	31.0	0.5	Net Non-Operating Income(Loss)	10.0	10.0	10.0	10.0	10.0	10.0
52											
53	13.0	13.4	24.0	24.1	NET INCOME(LOSS)	(142.4)	(154.0)	95.6	(2.0)	(411.1)	(1,343.4)

case # EEAYLR2

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED BALANCE SHEET
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					ASSETS						
2					FIXED ASSETS						
3	3,082.0	4,090.2	4,896.0	6,928.4	Gross Fixed Assets in Service	20,304.9	29,240.8	36,335.2	42,941.9	49,357.7	55,567.7
4	629.8	746.6	924.9	1,165.6	Less – Accumulated Depreciation	6,119.2	8,072.5	10,343.3	12,597.1	14,919.1	17,460.1
5											
6	2,452.2	3,343.6	3,971.1	5,762.8	Net Fixed Assets in Service	14,185.7	21,168.3	25,991.9	30,344.9	34,438.6	38,107.6
7	1,054.7	1,661.0	2,537.0	2,468.9	Capital Work-in-Progress	4,308.7	8,331.5	11,688.4	14,458.0	15,424.6	15,889.2
8											
9	3,506.9	5,004.6	6,508.1	8,231.6	TOTAL NET FIXED ASSETS	18,494.4	29,499.8	37,680.3	44,802.9	49,863.1	53,996.7
10											
11		1,544.0	1,544.0	1,544.0	RESERVE FOR FOREIGN DEBT	2,643.9	4,917.7	6,670.3	7,998.5	8,762.8	9,111.5
12											
13	53.5	56.5	56.5	56.5	INVESTMENTS	56.5	56.5	56.5	56.5	56.5	56.5
14											
15	36.1	105.7	131.4	173.0	LONG TERM RECEIVABLES	176.9	176.9	176.9	176.9	176.9	176.9
16											
17					CURRENT ASSETS						
18	165.9	139.3	134.5	192.5	Cash	0.0	0.0	0.0	0.0	0.0	0.0
19	197.0	242.1	344.0	433.6	Inventories	1,015.2	1,462.0	1,816.8	2,147.1	2,467.9	2,778.4
20	191.5	305.0	387.9	524.3	Customer Accts. Receivable	752.6	764.1	1,117.0	1,584.7	2,065.6	2,578.5
21	210.1	204.4	253.0	260.3	Other Accounts Receivable	225.0	210.0	200.0	200.0	200.0	200.0
22											
23	764.4	890.9	1,119.5	1,410.7	TOTAL CURRENT ASSETS	1,992.8	2,436.1	3,133.8	3,931.8	4,733.5	5,556.9
24											
25	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL ASSETS	23,364.5	37,087.0	47,717.7	56,966.6	63,592.8	68,898.5
26											
27											
28					LIABILITIES AND EQUITY						
29					EQUITY						
30	651.0	651.0	651.0	1,570.0	Capital	1,570.0	2,770.0	2,770.0	2,770.0	2,770.0	2,770.0
31	401.7	409.7	425.8	464.6	Reserves	467.5	467.5	467.5	467.5	467.5	467.5
					Foreign Grants for Fixed Assets	242.9	766.7	1,280.7	1,786.3	2,170.7	2,534.5
32					Reserve for Asset Revaluation	8,344.8	14,979.7	18,780.3	21,534.0	23,579.5	25,187.3
33	4.0	3.3	5.4	5.5	Other Provisions	5.1	5.1	5.1	5.1	5.1	5.1
34	35.7	48.7	62.1	86.1	Retained Earnings – prior years	110.2	(32.2)	(186.2)	(90.6)	(92.6)	(503.7)
35	13.1	13.4	23.9	24.1	Profit (Loss) – current year	(142.4)	(154.0)	95.6	(2.0)	(411.1)	(1,343.4)
36											
37	1,105.4	1,126.1	1,168.3	2,150.3	TOTAL EQUITY	10,598.1	18,802.7	23,213.0	26,470.4	28,489.0	29,117.4
38											
39					LONG-TERM DEBT						
40	1,428.4	3,277.4	3,739.2	4,839.7	Foreign Long-Term Debt	6,907.8	11,420.6	15,333.5	18,632.2	20,490.6	21,816.2
41	1,103.6	1,489.4	1,922.4	1,600.1	Local Long-Term Debt	309.3	218.5	127.7	90.8	90.8	90.8
42											
43	2,532.0	4,766.9	5,661.6	6,439.9	TOTAL LONG-TERM DEBT	7,217.1	11,639.1	15,461.2	18,723.0	20,581.4	21,907.0
44											
45					CURRENT LIABILITIES						
46	145.6	329.3	423.2	655.0	Foreign Debt due within one year	408.4	569.4	669.6	839.4	1,050.9	1,067.9
47	28.0	52.1	64.5	90.8	Local Debt due within one year	1,290.8	90.8	90.8	36.9	0.0	0.0
48	18.1	23.6	22.3	33.5	Accounts Payable – Suppliers	46.1	75.4	171.7	285.4	422.9	611.0
49	339.9	590.1	870.0	1,189.8	Ministry of Finance	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0
50	147.8	604.3	996.0	739.7	Other Accounts Payable	800.0	800.0	800.0	800.0	800.0	800.0
51	22.8	79.7	106.6	76.3	Deferred Liabilities	75.0	75.0	75.0	75.0	75.0	75.0
52	20.8	25.2	41.2	34.8	Deposits	35.0	35.0	35.0	35.0	35.0	35.0
53	0.0	0.0	2.1	2.1	Provision for Taxes						
54	0.6	4.5	3.6	3.7	Overdraft/Cash Requirement	1,694.0	3,799.6	6,001.4	8,501.5	10,938.5	14,085.1
55											
56	723.6	1,708.8	2,529.5	2,825.7	TOTAL CURRENT LIABILITIES	5,549.3	6,645.2	9,043.6	11,773.2	14,522.4	17,874.1
57											
58	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL LIABILITIES	23,364.5	37,087.0	47,717.7	56,966.6	63,592.8	68,898.5

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case # EEAYLR2

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED SOURCES AND USES OF FUNDS

(At Inflated Prices)

	--------Actual--------				(Millions of L.E)	Est.	----------Forecast----------				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1					SOURCES OF FUNDS						
2					==========						
3											
4					INTERNAL CASH GENERATION						
5	127.2	184.5	192.0	287.3	Gross Income before Interest	317.3	515.5	928.5	1,125.9	1,111.3	643.4
6	148.6	116.8	178.3	240.7	Depreciation	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
7											
8	275.9	301.3	370.3	528.0	TOTAL INTERNAL CASH GENERATION	856.3	1,245.1	1,988.3	2,448.8	2,677.5	2,438.4
9											
10					EXTERNAL SOURCES						
11	0.0	0.0	0.0	919.0	Increase in Equity Capital	0.0	1,200.0	0.0	0.0	0.0	0.0
12	129.8	7.3	18.2	38.9	Change in Reserves & Provisions	2.5	0.0	0.0	0.0	0.0	0.0
					Foreign Grants	242.9	523.7	514.0	505.6	384.3	363.8
13											
14	238.6	2,163.3	887.6	1,692.6	New Long Term Debt — Foreign	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
15	267.6	420.4	495.2	(167.6)	New Long Term Debt — Local	0.0	0.0	0.0	0.0	0.0	0.0
16											
17	506.2	2,583.7	1,382.8	1,524.9	Total New Long Term Debt	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
18											
19	911.9	2,892.3	1,771.4	3,010.8	TOTAL SOURCES OF FUNDS	2,478.3	5,936.6	5,415.3	5,819.7	5,239.6	4,863.9
20											
21					APPLICATIONS OF FUNDS						
22					==========						
23											
24	498.2	3,158.5	1,681.7	1,964.3	CAPITAL EXPENDITURES (incl.IDC)	2,457.1	5,100.0	5,439.8	5,691.7	4,581.0	4,320.7
25											
26					DEBT SERVICE						
27	121.3	130.7	331.9	360.3	Foreign Debt Repayment	655.0	567.9	652.5	725.0	872.1	1,067.7
28	44.6	10.4	49.8	128.3	Local Debt Repayment	90.8	1,290.8	90.8	90.8	36.9	0.0
29	114.2	171.1	163.1	263.2	Interest (Net of IDC)	459.7	669.6	832.8	1,127.9	1,522.3	1,986.8
30											
31	280.1	312.2	549.8	751.7	TOTAL NET DEBT SERVICE	1,205.5	2,528.2	1,576.1	1,943.7	2,431.4	3,054.5
32											
33	0.0	3.0	0.0	0.0	INCREASE IN INVESTMENTS	0.0	0.0	0.0	0.0	0.0	0.0
34											
35	(3.0)	69.6	25.7	41.6	INCREASE IN LONG TERM RECEIVABLES	3.9	0.0	0.0	0.0	0.0	0.0
36											
37	121.7	(620.6)	(481.9)	195.2	NET INCREASE IN WORKING CAPITAL	694.7	414.0	601.3	684.3	664.2	635.3
38					(Excluding Cash, Overdraft,LTD)						
39											
40	897.0	2,922.7	1,775.4	2,952.9	TOTAL APPLICATIONS OF FUNDS	4,361.2	8,042.2	7,617.1	8,319.8	7,676.6	8,010.6
41											
42	14.8	(30.4)	(4.0)	58.0	NET CHANGE IN CASH	(1,882.8)	(2,105.6)	(2,201.8)	(2,500.1)	(2,437.0)	(3,146.6)
43											
44	150.5	165.3	134.9	130.9	OPENING CASH	188.8	(1,694.1)	(3,799.6)	(6,001.5)	(8,501.6)	(10,938.6)
45											
46	165.3	134.9	130.9	188.8	CLOSING CASH	(1,694.1)	(3,799.6)	(6,001.5)	(8,501.6)	(10,938.6)	(14,085.2)

case # EEAYLR2

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED TRENDS AND RATIOS

(At Inflated Prices)

	Actual					Est.	Forecast				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)–Annual Growth –%	6.51%	6.89%	6.42%	6.32%	6.33%	3.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)–Annual Growth –%	50.21%	47.68%	78.67%	41.87%	30.35%	24.83%
5											
6	16.4	22.0	24.0	30.5	Average Tariff —EL mills/kwh	43.1	59.5	99.9	133.3	163.4	192.4
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales – %	32.2%	35.7%	45.5%	53.3%	60.6%	70.1%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales – %	17.9%	19.9%	20.3%	17.4%	13.1%	6.1%
12					Operating Income to Gross Assets						
13					in Service (Average) – %:						
14	2.5%	4.3%	3.0%	4.1%	–historical	6.7%	9.2%	13.2%	12.8%	10.8%	7.2%
15					–revalued	1.6%	1.9%	2.6%	2.6%	2.2%	1.1%
16					Net Income to Equity – %:						
17	2.3%	1.2%	2.1%	1.5%	–historical	6.5%	9.6%	19.8%	19.1%	12.5%	–5.0%
18					–revalued	–2.2%	–1.0%	0.5%	0.0%	–1.5%	–4.7%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	–20.5%	Self-Financing Ratio (WB)– %	–32.9%	–39.2%	–3.5%	–3.4%	–8.6%	–28.4%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.23	0.33	0.53	0.65	0.71	0.65
		0.3%	–7.8%	–10.9%	Self-Financing Ratio (RCG)– %	–11.0%	–29.6%	7.6%	9.6%	5.1%	–14.0%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.4	0.3	0.3	0.3	0.3
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales – months	–11.8	–18.0	–15.9	–15.9	–15.7	–16.2
29	136	151	168	167	Accts.Receivable to Sales –days	160	110	90	90	90	90
30					Debt to Equity Ratio – %						
31	244.8%	457.2%	526.4%	334.2%	–historical	395.7%	321.7%	366.0%	397.0%	440.6%	584.6%
32					–revalued	84.1%	65.4%	69.9%	74.0%	75.9%	78.9%

APPENDIX S: CASE EEA-Y220 "SMOOTHED" SFR

case # EEAY220

EGYPTIAN ELECTRICITY AUTHORITY

INPUT ASSUMPTIONS

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1	1.350	2.310	2.599	2.750	Exchange Rate -- L.E./US$	3.300	4.310	4.940	5.350	5.560	5.650
2				3.70%	Inflation Rate -- International %	8.70%	6.20%	2.20%	1.70%	2.50%	3.10%
3				15.00%	-- Egyptian %	20.00%	20.00%	15.00%	9.00%	6.00%	5.00%
4			0.8868	0.9200	Inflation Index -- International	1.0000	1.0620	1.0854	1.1038	1.1314	1.1665
5			0.7246	0.8333	Inflation Index -- Egyptian	1.0000	1.2000	1.3800	1.5042	1.5945	1.6742
6	4.00%	4.31%	4.53%	4.08%	Station Losses -- %	4.10%	4.10%	4.10%	4.10%	4.10%	4.10%
7	7.64%	7.72%	7.16%	6.31%	System Losses -- %	6.16%	5.86%	5.33%	5.00%	4.80%	4.44%
8					International Fuel Prices ($/MBTU) --						
9			4.69	4.69	-- Distillate	4.14	3.93	4.18	4.37	4.51	4.71
10			2.43	2.43	-- Residual	1.69	1.56	1.80	2.03	2.09	2.18
11			2.43	2.43	-- Natural Gas	1.69	1.56	1.80	2.03	2.09	2.18
12			1.80	1.80	-- Coal	1.80	1.80	1.80	1.80	1.80	1.80
13					* IF INFLATION IS TO BE PUT INTO *	******* *					
14					* FORECAST, INSERT "1" HERE >>>>>>	1	<<<<<< OTHERWISE, SET AT "0"				
15						******* *					
16					Interest Rate on New FX Loans -%	7.00%	*******	*******	*******	*******	*******
17					Interest Rate on New EL Loans -%	11.25%	*******	*******	*******	*******	*******
18	5.0%	3.3%	3.7%	3.5%	Depreciation Expense Rate %	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
19	136	151	168	167	Customer Accts Rec. -- days' sales	160	110	90	90	90	90
20	149	102	110	83	Other Accts Rec. -- days' sales	48	30	20	11	7	6
21	6.4%	5.9%	7.0%	6.3%	Inventories -- % of G F A	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
22					TARGET SELF-FINANCING RATIO % (WB)		20.0%	30.0%	35.0%	35.0%	35.0%
23					EEA Fuel Price as % Int'l Price	26.8%	43.8%	50.0%	63.0%	80.0%	100.0%

case # EEAY220

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED INCOME STATEMENT
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1											
2	35202	37847	39583	41649	Gross Generation(Gwh)	44297	47201	49947	52921	56155	59311
3	33794	36216	37790	39950	Net Energy Sent Out(Gwh)	42481	45266	47899	50751	53852	56879
4	31212	33420	35084	37429	Net Energy Sold(Gwh)	39864	42612	45346	48213	51267	54352
5	16.4	22.0	24.0	30.5	Average Tariff (Millimes/Kwh)	43.1	59.5	82.0	139.0	192.0	229.0
6											
7											
8											
9					OPERATING REVENUE						
10	513.2	734.9	840.4	1,142.9	Sales of Electricity	1,716.8	2,535.4	3,718.4	6,701.6	9,843.3	12,446.5
11	0.2	0.4	0.9	0.9	Other operating Revenue						
12											
13	513.5	735.3	841.3	1,143.8	TOTAL OPERATING REVENUE	1,716.8	2,535.4	3,718.4	6,701.6	9,843.3	12,446.5
14											
15					OPERATING EXPENSES						
16	147.5	256.1	265.9	330.8	Fuel @ Base Year	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
17					Inflation			792.3	1,511.1	2,412.7	3,660.8
18					Total	552.8	904.2	2,060.4	3,425.0	5,074.9	7,332.0
19		0.7	0.4	1.6	Purchases from Sales @ Base Year	1.5	1.5	1.5	1.5	1.5	1.5
20					Inflation	(0.0)	0.3	0.6	0.8	0.9	1.0
21					Total	1.5	1.9	2.1	2.3	2.5	2.6
22	48.3	58.1	69.5	82.3	Salaries & Wages (Operation only)	90.7	93.3	100.5	105.0	111.0	116.0
23					Inflation	(0.0)	18.7	38.2	52.9	66.0	78.2
24					Total	90.7	111.9	138.7	157.9	177.0	194.2
25	80.6	62.1	112.0	138.2	Materials & Services Input	158.3	164.0	178.1	187.0	199.4	208.4
26					Inflation	(0.0)	32.8	67.7	94.3	118.5	140.5
27					Total	158.3	196.8	245.7	281.3	317.9	348.9
28	38.2	42.7	52.1	60.9	Other Operating Expenses(Admin)	67.1	71.3	75.9	80.8	86.1	90.3
29					Inflation	(0.0)	14.3	28.8	40.7	51.2	60.9
30					Total	67.1	85.6	104.7	121.5	137.3	151.1
31	152.8	133.1	180.3	243.2	Depreciation -- Historical	253.3	282.9	338.2	425.8	540.2	671.0
32					-- Revaluation	285.8	446.6	721.6	897.0	1,026.0	1,124.0
33	152.8	133.1	180.3	243.2	Total	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
34											
35	467.3	552.8	680.3	857.0	TOTAL OPERATING EXPENSES	1,409.5	2,029.9	3,611.6	5,310.9	7,275.8	9,823.8
36											
37											
38	46.2	182.5	161.1	286.8	INCOME FROM OPERATIONS	307.3	505.5	106.8	1,390.7	2,567.5	2,622.7
39											
40	148.7	247.1	284.3	432.1	Gross Interest	580.6	880.7	1,377.3	1,913.3	2,302.7	2,524.8
41	34.5	76.0	116.3	168.9	Interest During Construction	121.0	211.1	508.0	708.6	764.7	701.2
42											
43	114.2	171.1	168.1	263.2	NET INTEREST EXPENSE	459.7	669.6	869.3	1,204.7	1,538.1	1,823.6
44											
45											
46	(68.0)	11.5	(7.0)	23.6	NET OPERATING INCOME	(152.4)	(164.0)	(762.5)	186.0	1,029.5	799.1
47											
48	103.1	51.0	82.4	88.4	Non-Operating Income	85.0	85.0	85.0	85.0	85.0	85.0
49	22.0	49.1	51.4	87.9	Less:Non-operating Expenses	75.0	75.0	75.0	75.0	75.0	75.0
50											
51	81.1	2.0	31.0	0.5	Net Non-Operating Income(Loss)	10.0	10.0	10.0	10.0	10.0	10.0
52											
53	13.0	13.4	24.0	24.1	NET INCOME(LOSS)	(142.4)	(154.0)	(752.5)	196.0	1,039.5	809.1

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case # EEAY220

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED BALANCE SHEET
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					ASSETS						
2					FIXED ASSETS						
3	3,082.0	4,090.2	4,596.0	6,928.4	Gross Fixed Assets in Service	20,304.9	29,240.8	36,335.2	42,941.9	49,357.7	55,567.7
4	629.8	746.6	924.9	1,165.6	Less – Accumulated Depreciation	6,119.2	8,072.5	10,343.3	12,597.1	14,919.1	17,460.1
5											
6	2,452.2	3,343.6	3,971.1	5,762.8	Net Fixed Assets in Service	14,185.7	21,168.3	25,991.9	30,344.9	34,438.6	38,107.6
7	1,054.7	1,661.0	2,537.0	2,468.9	Capital Work-in-Progress	4,308.7	8,331.5	11,688.4	14,458.0	15,424.6	15,889.2
8											
9	3,506.9	5,004.6	6,508.1	8,231.6	TOTAL NET FIXED ASSETS	18,494.4	29,499.8	37,680.3	44,802.9	49,863.1	53,996.7
10											
11		1,544.0	1,544.0	1,544.0	RESERVE FOR FOREIGN DEBT	2,643.9	4,917.7	6,670.3	7,998.5	8,762.8	9,111.5
12											
13	53.5	56.5	56.5	56.5	INVESTMENTS	56.5	56.5	56.5	56.5	56.5	56.5
14											
15	36.1	105.7	131.4	173.0	LONG TERM RECEIVABLES	176.9	176.9	176.9	176.9	176.9	176.9
16											
17					CURRENT ASSETS						
18	165.9	139.3	134.5	192.5	Cash	0.0	0.0	0.0	0.0	0.0	0.0
19	197.0	242.1	344.0	433.6	Inventories	1,015.2	1,462.0	1,816.8	2,147.1	2,467.9	2,778.4
20	191.5	305.0	387.9	524.3	Customer Accts. Receivable	752.6	764.1	916.9	1,652.5	2,427.1	3,069.0
21	210.1	204.4	253.0	260.3	Other Accounts Receivable	225.0	210.0	200.0	200.0	200.0	200.0
22											
23	764.4	890.9	1,119.5	1,410.7	TOTAL CURRENT ASSETS	1,992.8	2,436.1	2,933.6	3,999.6	5,095.0	6,047.4
24											
25	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL ASSETS	23,364.5	37,087.0	47,517.6	57,034.3	63,954.3	69,389.0
26											
27											
28					LIABILITIES AND EQUITY						
29					EQUITY						
30	651.0	651.0	651.0	1,570.0	Capital	1,570.0	2,770.0	2,770.0	2,770.0	2,770.0	2,770.0
31	401.7	409.7	425.3	464.6	Reserves	467.5	467.5	467.5	467.5	467.5	467.5
					Foreign Grants for Fixed Assets	242.9	766.7	1,280.7	1,786.3	2,170.7	2,534.5
32					Reserve for Asset Revaluation	8,344.8	14,979.7	18,780.3	21,534.0	23,579.5	25,187.3
33	4.0	3.3	5.4	5.5	Other Provisions	5.1	5.1	5.1	5.1	5.1	5.1
34	35.7	48.7	62.1	86.1	Retained Earnings – prior years	110.2	(32.2)	(186.2)	(938.7)	(742.7)	296.7
35	13.1	13.4	23.9	24.1	Profit (Loss) – current year	(142.4)	(154.0)	(752.5)	196.0	1,039.5	809.1
36											
37	1,105.4	1,126.1	1,168.3	2,150.3	TOTAL EQUITY	10,598.1	18,802.7	22,364.8	25,820.2	29,289.4	32,070.2
38											
39					LONG-TERM DEBT						
40	1,428.4	3,277.4	3,739.2	4,839.7	Foreign Long-Term Debt	6,907.8	11,420.6	15,333.5	18,632.2	20,490.6	21,816.2
41	1,103.6	1,489.4	1,922.4	1,600.1	Local Long-Term Debt	309.3	218.5	127.7	90.8	90.8	90.8
42											
43	2,532.0	4,766.9	5,661.6	6,439.9	TOTAL LONG-TERM DEBT	7,217.1	11,639.1	15,461.2	18,723.0	20,581.4	21,907.0
44											
45					CURRENT LIABILITIES						
46	145.6	329.3	423.2	655.0	Foreign Debt due within one year	408.4	569.4	669.6	839.4	1,050.9	1,067.9
47	28.0	52.1	64.5	90.8	Local Debt due within one year	1,290.8	90.8	90.8	36.9	0.0	0.0
48	18.1	23.6	22.3	33.5	Accounts Payable – Suppliers	46.1	75.4	171.7	285.4	422.9	611.0
49	339.9	590.1	870.0	1,189.8	Ministry of Finance	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0
50	147.8	604.3	996.0	739.7	Other Accounts Payable	800.0	800.0	800.0	800.0	800.0	800.0
51	22.8	79.7	106.6	76.3	Deferred Liabilities	75.0	75.0	75.0	75.0	75.0	75.0
52	20.8	25.2	41.2	34.8	Deposits	35.0	35.0	35.0	35.0	35.0	35.0
53	0.0	0.0	2.1	2.1	Provision for Taxes						
54	0.6	4.5	3.6	3.7	Overdraft/Cash Requirement	1,694.0	3,799.6	6,649.4	9,219.5	10,499.7	11,622.9
55											
56	723.6	1,708.8	2,529.5	2,825.7	TOTAL CURRENT LIABILITIES	5,549.3	6,645.2	9,691.6	12,491.2	14,083.5	15,411.8
57											
58	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL LIABILITIES	23,364.5	37,087.0	47,517.6	57,034.3	63,954.3	69,389.0

case # EEAY220

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED SOURCES AND USES OF FUNDS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SOURCES OF FUNDS						
2					==========						
3											
4					INTERNAL CASH GENERATION						
5	127.2	184.5	192.0	287.3	Gross Income before Interest	317.3	515.5	116.8	1,400.7	2,577.5	2,632.7
6	148.6	116.8	178.3	240.7	Depreciation	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
7											
8	275.9	301.3	370.3	528.0	TOTAL INTERNAL CASH GENERATION	856.3	1,245.1	1,176.7	2,723.6	4,143.7	4,427.7
9											
10					EXTERNAL SOURCES						
11	0.0	0.0	0.0	919.0	Increase in Equity Capital	0.0	1,200.0	0.0	0.0	0.0	0.0
12	129.8	7.3	18.2	38.9	Change in Reserves & Provisions	2.5	0.0	0.0	0.0	0.0	0.0
					Foreign Grants	242.9	523.7	514.0	505.6	384.3	363.8
13											
14	238.6	2,163.3	887.6	1,692.6	New Long Term Debt — Foreign	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
15	267.6	420.4	495.2	(167.6)	New Long Term Debt — Local	0.0	0.0	0.0	0.0	0.0	0.0
16											
17	506.2	2,583.7	1,382.8	1,524.9	Total New Long Term Debt	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
18											
19	911.9	2,892.3	1,771.4	3,010.8	TOTAL SOURCES OF FUNDS	2,478.3	5,936.6	4,603.6	6,094.5	6,705.8	6,853.2
20											
21					APPLICATIONS OF FUNDS						
22					==========						
23											
24	498.2	3,158.5	1,681.7	1,964.3	CAPITAL EXPENDITURES (incl.IDC)	2,457.1	5,100.0	5,439.8	5,691.7	4,581.0	4,320.7
25											
26					DEBT SERVICE						
27	121.3	130.7	331.9	360.3	Foreign Debt Repayment	655.0	567.9	652.5	725.0	872.1	1,067.7
28	44.6	10.4	49.8	128.3	Local Debt Repayment	90.8	1,290.8	90.8	90.8	36.9	0.0
29	114.2	171.1	168.1	263.2	Interest (Net of IDC)	459.7	669.6	869.3	1,204.7	1,538.1	1,823.6
30											
31	280.1	312.2	549.8	751.7	TOTAL NET DEBT SERVICE	1,205.5	2,528.2	1,612.5	2,020.6	2,447.1	2,891.3
32											
33	0.0	3.0	0.0	0.0	INCREASE IN INVESTMENTS	0.0	0.0	0.0	0.0	0.0	0.0
34											
35	(3.0)	60.6	25.7	41.6	INCREASE IN LONG TERM RECEIVABLES	3.9	0.0	0.0	0.0	0.0	0.0
36											
37	121.7	(620.6)	(481.9)	195.2	NET INCREASE IN WORKING CAPITAL	694.7	414.0	401.1	952.2	958.0	764.3
38					(Excluding Cash, Overdraft,LTD)						
39											
40	897.0	2,922.7	1,775.4	2,952.9	TOTAL APPLICATIONS OF FUNDS	4,361.2	8,042.2	7,453.5	8,664.5	7,986.1	7,976.4
41											
42	14.8	(30.4)	(4.0)	58.0	NET CHANGE IN CASH	(1,882.8)	(2,105.6)	(2,849.8)	(2,570.0)	(1,280.2)	(1,123.2)
43											
44	150.5	165.3	134.9	130.9	OPENING CASH	188.8	(1,694.1)	(3,799.6)	(6,649.5)	(9,219.5)	(10,499.7)
45											
46	165.3	134.9	130.9	188.8	CLOSING CASH	(1,694.1)	(3,799.6)	(6,649.5)	(9,219.5)	(10,499.7)	(11,622.9)

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case # EEAY220

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED TRENDS AND RATIOS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)–Annual Growth –%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)–Annual Growth –%	50.21%	47.68%	46.08%	80.23%	40.88%	26.45%
5											
6	16.4	22.0	24.0	30.5	Average Tariff —EL mills/kwh	43.1	59.5	82.0	139.0	192.0	229.0
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales – %	32.2%	35.7%	55.4%	51.1%	51.6%	58.9%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales – %	17.9%	19.9%	2.9%	20.8%	26.1%	21.1%
12					Operating Income to Gross Assets						
13					in Service (Average) – %:						
14	2.5%	4.3%	3.0%	4.1%	–historical	6.7%	9.2%	6.7%	14.6%	18.0%	15.1%
15					–revalued	1.6%	1.9%	0.3%	3.2%	5.1%	4.5%
16					Net income to Equity – %:						
17	2.3%	1.2%	2.1%	1.5%	–historical	6.5%	9.6%	–0.8%	27.8%	41.3%	30.7%
18					–revalued	–2.2%	–1.0%	–3.7%	0.8%	3.8%	2.6%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	–20.5%	Self–Financing Ratio (WB)– %	–32.9%	–39.2%	–15.5%	–4.8%	15.2%	17.5%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.24	0.34	0.32	0.76	1.15	1.23
		0.3%	–7.8%	–10.9%	Self–Financing Ratio (RCG)– %	–11.0%	–29.6%	–8.1%	13.4%	34.9%	34.9%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.4	0.3	0.3	0.4	0.4
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales – months	–11.3	–18.0	–21.5	–16.5	–12.8	–11.2
29	136	151	168	167	Accts.Receivable to Sales –days	160	110	90	90	90	90
30					Debt to Equity Ratio – %						
31	244.8%	457.2%	526.4%	334.2%	–historical	395.7%	321.7%	452.5%	457.3%	378.9%	333.8%
32					–revalued	84.1%	65.4%	72.5%	75.9%	73.9%	71.6%

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EGYPTIAN ELECTRICITY SYSTEM

TABULATION OF KEY RESULTS

Date: 18-Sep
EEA FILE EEAY220
EDA FILE EDAY220

Year end June 30	Est. 1991	Forecast 1992	1993	1994	1995	1996
1 Border Price -- Mazout -- $/Tonne	70.1	64.7	74.7	84.2	86.7	90.5
LE/Tonne	231.4	279.0	369.0	450.6	482.2	511.1
2 Exchange Rate	3.300	4.310	4.940	5.350	5.560	5.650
3 Mazout Transfer Price to EEA						
--LE/Tonne	55.0	83.7	184.5	283.9	385.7	511.1
4 Gas Transfer Price to EEA						
--LE/Tonne	66.0	98.3	184.5	283.9	385.7	511.1
5 Mazout price to EEA as % Mazout Border Price	23.8%	30.0%	50.0%	63.0%	80.0%	100.0%
Gas price to EEA as % Mazout Border Price	28.5%	35.2%	50.0%	63.0%	80.0%	100.0%
6 Target Self-finacing Ratio (WB) - %	0.0%	20.0%	30.0%	35.0%	35.0%	35.0%
7 Self-financing Ratio -- WB Definition	-32.9%	-39.2%	-15.5%	-4.8%	15.2%	17.5%
-- RCG Definition	-11.0%	-29.6%	-8.1%	13.4%	34.9%	34.9%
8 Revenue Requirement for Above Assumptions (Millimes / kwh)						
-- EEA Requirement	43.1	59.5	82.0	139.0	192.0	229.0
-- EDA Requirement	70.2	91.4	197.8	247.4	292.3	350.6
-- System Requirement	61.6	81.2	131.9	205.4	273.7	327.7
9 % Real Increase Required						
-- EEA		38.2%	37.8%	69.5%	38.1%	19.3%
-- EDA		30.1%	116.4%	25.1%	18.2%	19.9%
-- System		31.9%	62.4%	55.7%	33.2%	19.8%

APPENDIX T: TARIFF CLASS REVENUE RESPONSIBILITIES FOR FY 94 THROUGH FY 96 (LRMC-BASED TARGETS)

This appendix contains tables that define the revenue responsibilities by tariff class for the years FY 94 through FY 96. These revenue responsibilities are derived from the LRMC-based yield targets and are stated in nominal (i.e., current year) terms, the best assumptions today about future inflation. Therefore, the revenue responsibilities in the following tables cannot be directly used for tariff design for years FY 94 and beyond. Rather, these data will need to be recomputed prior to each tariff update in the future and utilizing the most current data on actual inflation in the past -- i.e., since FY 91 (the currency in which the LRMC analysis was done in this report) -- and best estimate at the time of future inflation.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – BULK

BILLING YEAR	FY94
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	2563
AVERAGE (LE/KWH) 1/	0.1333

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
VHV INDUSTRY	3271	0.0435	0.1378	0.1102	153%	0.1102	153%
HV INDUSTRY/AGRI	1218	0.0807	0.1706	0.1365	69%	0.1706	111%
MV INDUSTRY/AGRI	126	0.1355	0.2160	0.1723	28%	0.2160	59%
DISTRIBUTION COS.	14615	0.0624	0.1723	0.1378	121%	0.1346	116%
TOTAL EEA BULK	19229	0.0608	0.1666	0.1333	119%	0.1333	119%

1/ Approximate revenue target for FY94.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY94 prices, a 38.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – RETAIL

BILLING YEAR	FY94
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	2812
AVERAGE (LE/KWH) 1/	0.2133

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
LARGE IND/AG	3891	0.1416	0.2160	0.1728	22%	0.2160	53%
MEDIUM IND/AG	139	0.1202	0.2764	0.2211	84%	0.2764	130%
SMALL IND/AG	1772	0.1261	0.2804	0.2244	78%	0.2804	122%
FREE ZONE - MV	6	0.1264	0.2160	0.1728	37%	0.2160	71%
FREE ZONE - LV	6	0.1843	0.2764	0.2211	20%	0.2764	50%
RESIDENTIAL	5602	0.0421	0.2934	0.2348	458%	0.1770	320%
COMMERCIAL	827	0.1083	0.3106	0.2485	129%	0.2485	129%
STREET LIGHTING	589	0.1855	0.2998	0.2398	29%	0.2998	62%
SALE FOR RESALE	350	0.0600	0.1695	0.1356	126%	0.1695	182%
TOTAL DC RETAIL	13183	0.0947	0.2667	0.2133	125%	0.2133	125%
TOTAL SYSTEM		0.846	0.2361	0.1889	123%	0.1415	126%

1/ Approximate revenue target for FY94.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY94 prices, a 38.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – BULK

BILLING YEAR	FY95
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	3143
AVERAGE (LE/KWH) 1/	0.1635

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
VHV INDUSTRY	3271	0.0435	0.1502	0.1352	211%	0.1352	211%
HV INDUSTRY/AGRI	1218	0.0807	0.1859	0.1673	107%	0.1859	130%
MV INDUSTRY/AGRI	126	0.1355	0.2354	0.2119	56%	0.2354	74%
DISTRIBUTION COS.	14615	0.0624	0.1878	0.1690	171%	0.1673	168%
TOTAL EEA BULK	19229	0.0608	0.1816	0.1635	169%	0.1635	169%

1/ Approximate revenue target for FY95.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY95 prices, a 50.42% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – RETAIL

BILLING YEAR	FY95
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	3449
AVERAGE (LE/KWH) 1/	0.2616

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
LARGE IND/AG	3891	0.1416	0.2354	0.2119	50%	0.2354	66%
MEDIUM IND/AG	139	0.1202	0.3012	0.2711	125%	0.3012	151%
SMALL IND/AG	1772	0.1261	0.3057	0.2751	118%	0.3057	142%
FREE ZONE - MV	6	0.1264	0.2354	0.2119	68%	0.2354	86%
FREE ZONE - LV	6	0.1843	0.3012	0.2711	47%	0.3012	63%
RESIDENTIAL	5602	0.0421	0.3199	0.2879	584%	0.2563	509%
COMMERCIAL	827	0.1083	0.3386	0.3047	181%	0.3047	181%
STREET LIGHTING	589	0.1855	0.3267	0.2941	59%	0.3267	76%
SALE FOR RESALE	350	0.0600	0.1847	0.1663	177%	0.1847	208%
TOTAL DC RETAIL	13183	0.0947	0.2907	0.2616	176%	0.2616	176%
TOTAL SYSTEM		0.0846	0.2573	0.2316	174%	0.233	175%

1/ Approximate revenue target for FY95.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY95 prices, a 50.42% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – BULK

BILLING YEAR	FY96
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	3702
AVERAGE (LE/KWH) 1/	0.1925

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
VHV INDUSTRY	3271	0.0435	0.1592	0.1592	266%	0.1592	266%
HV INDUSTRY/AGRI	1218	0.0807	0.1971	0.1971	144%	0.1971	144%
MV INDUSTRY/AGRI	126	0.1355	0.2496	0.2496	84%	0.2496	84%
DISTRIBUTION COS.	14615	0.0624	0.1991	0.1991	219%	0.1991	219%
TOTAL EEA BULK	19229	0.0608	0.1925	0.1925	217%	0.1925	217%

1/ Approximate revenue target for FY96.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY96 prices, a 59.45% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – RETAIL

BILLING YEAR	FY96
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	4062
AVERAGE (LE/KWH) 1/	0.3081

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
LARGE IND/AG	3891	0.1416	0.2496	0.2496	76%	0.2496	76%
MEDIUM IND/AG	139	0.1202	0.3193	0.3193	166%	0.3193	166%
SMALL IND/AG	1772	0.1261	0.3240	0.3240	157%	0.3240	157%
FREE ZONE - MV	6	0.1264	0.2496	0.2496	98%	0.2496	98%
FREE ZONE - LV	6	0.1843	0.3193	0.3193	73%	0.3193	73%
RESIDENTIAL	5602	0.0421	0.3391	0.3391	705%	0.3389	705%
COMMERCIAL	827	0.1083	0.3589	0.3589	231%	0.3589	231%
STREET LIGHTING	589	0.1855	0.3463	0.3463	87%	0.3463	87%
SALE FOR RESALE	350	0.0600	0.1958	0.1958	226%	0.1958	226%
TOTAL DC RETAIL	13183	0.0947	0.3081	0.3081	225%	0.3081	225%
TOTAL SYSTEM		0.0846	0.2727	0.2727	222%	0.2727	222%

1/ Approximate revenue target for FY96.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY96 prices, a 59.45% increase.

APPENDIX U: ALTERNATE TARIFF DESIGN: "LOW LRMC CASE"

This appendix presents a tariff design referred to as the "Low LRMC Case." This tariff design differs from that presented in the main text in that the revenue responsibilities in each year are based upon an estimate of LRMC derived utilizing the 6 percent discount rate assumption (as opposed to the 10 percent discount rate used for the "Base Case LRMC" estimates utilized for the recommended tariff design). However, the basis for this tariff design -- determination of revenue responsibilities by tariff class, block sizing, price levels in each block, etc. -- parallels that used for the tariff design in the main text.

Exhibit 7-7A
Target Yields for Tariff Design: Low LRMC Case*

Fiscal Year	LRMC Average Revenue in Current Year Currency (P/kWh)	EEA	EDA	System
1. 1993	1. LRMC	13.18	19.88	17.83
	2. Target Yield = 69% of LRMC	9.09	13.72	12.31
	3. Revenue Requirement from Financial Model	12.55	19.78	17.94
2. 1994	1. LRMC	15.16	22.87	20.51
	2. Target Yield = 80% of LRMC	12.13	18.29	16.41
	3. Revenue Requirement from Financial Model	15.70	24.74	22.51
3. 1995	1. LRMC	16.52	24.92	22.36
	2. Target Yield = 90% of LRMC	14.87	22.43	20.12
	3. Revenue Requirement from Financial Model	18.50	29.23	26.66
4. 1996	1. LRMC	17.51	26.42	23.70
	2. Target Yield = 100% of LRMC	17.51	26.42	23.70
	3. Revenue Requirement from Financial Model	22.25	35.06	32.06

* Inflation rates utilized to convert LRMC estimates originally determined in FY 91 currency are as follows: FY 92 (20%), FY 93 (15%), FY 94 (9%), and FY 95 (6%). These result in the following overall multipliers for converting LRMC values in FY 91 P/kWh to current year P/kWh: FY 93 (1.200), FY 94 (1.380), FY 95 (1.504), and FY 96 (1.594).

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – BULK

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1749
AVERAGE (LE/KWH) 1/	0.0909

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHNG
VHV INDUSTRY	3271	0.0435	0.1198	0.0779	79%	0.0862	79%
HV INDUSTRY/AGRI	1218	0.0807	0.1338	0.0923	14%	0.1338	66%
MV INDUSTRY/AGRI	126	0.1355	0.1643	0.1133	-16%	0.1643	21%
DISTRIBUTION COS.	14615	0.0624	0.1356	0.0936	50%	0.0878	44%
TOTAL EEA BULK	19229	0.0608	0.1318	0.0909	50%	0.0909	50%

1/ Approximate revenue target for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 20.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – RETAIL

BILLING YEAR	FY93
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	1809
AVERAGE (LE/KWH) 1/	0.1372

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	CURRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHNG
LARGE IND/AG	3891	0.1416	0.1643	0.1133	20%	0.1643	16%
MEDIUM IND/AG	139	0.1202	0.2058	0.1420	18%	0.2058	71%
SMALL IND/AG	1772	0.1261	0.2081	0.1436	14%	0.2081	65%
FREE ZONE - MV	6	0.1264	0.1643	0.1133	-10%	0.1643	30%
FREE ZONE - LV	6	0.1843	0.2058	0.1420	-23%	0.2058	12%
RESIDENTIAL	5602	0.0421	0.2172	0.1499	256%	0.0845	101%
COMMERCIAL	827	0.1083	0.2279	0.1573	45%	0.1573	45%
STREET LIGHTING	589	0.1855	0.2207	0.1523	-18%	0.2207	19%
SALE FOR RESALE	350	0.0600	0.1338	0.0923	54%	0.1056	76%
TOTAL DC RETAIL	13183	0.0947	0.1988	0.1600	45%	0.1372	45%
TOTAL SYSTEM	17797	0.0846	0.1783	0.1600	45%	0.1278	51%

1/ Approximate revenue target for FY93.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY93 prices, a 20.00% increase.

Exhibit 7-8A (continued)

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – BULK

BILLING YEAR	FY94
TOTAL GRID SALES (GWH)	19229
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	2332
AVERAGE (LE/KWH) 1/	0.1213

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
VHV INDUSTRY	3271	0.0435	0.1298	0.1039	139%	0.1039	139%
HV INDUSTRY/AGRI	1218	0.0807	0.1539	0.1231	53%	0.1539	91%
MV INDUSTRY/AGRI	126	0.1355	0.1889	0.1511	12%	0.1889	39%
DISTRIBUTION COS.	14615	0.0624	0.1559	0.1247	100%	0.1219	95%
TOTAL EEA BULK	19229	0.0608	0.1516	0.1213	99%	0.1213	99%

1/ Approximate revenue target for FY94.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY94 prices, a 38.00% increase.

EEA/UNIFIED POWER SYSTEM
REVENUE RESPONSIBILITY BY CUSTOMER/TARIFF CLASS – RETAIL

BILLING YEAR	FY94
TOTAL GRID SALES (GWH)	13183
REVENUE REQUIREMENT	
TOTAL (LE MILLION)	2411
AVERAGE (LE/KWH) 1/	0.1829

CUSTOMER/ TARIFF CLASS	FY91/H1 SALES GWH	URRENT YIELD2/ LE/KWH	STRICT LRMC3/ LE/KWH	REVENUE NEUTRAL STRICT LRMC LE/KWH	% CHNG	REVENUE RESPONSIBILITY LE/KWH	% CHN
LARGE IND/AG	3891	0.1416	0.1889	0.1511	7%	0.1889	33%
MEDIUM IND/AG	139	0.1202	0.2367	0.1894	57%	0.2367	97%
SMALL IND/AG	1772	0.1261	0.2394	0.1915	52%	0.2394	90%
FREE ZONE - MV	6	0.1264	0.1889	0.1511	20%	0.1889	49%
FREE ZONE - LV	6	0.1843	0.2367	0.1894	3%	0.2367	28%
RESIDENTIAL	5602	0.0421	0.2498	0.1998	375%	0.1498	256%
COMMERCIAL	827	0.1083	0.2621	0.2097	94%	0.2097	94%
STREET LIGHTING	589	0.1855	0.2538	0.2031	9%	0.2538	37%
SALE FOR RESALE	350	0.0600	0.1539	0.1231	105%	0.1539	157%
TOTAL DC RETAIL	13183	0.0947	0.2287	0.1829	93%	0.1829	93%
TOTAL SYSTEM	17797	0.0846	0.2051	0.1641		0.1664	97%

1/ Approximate revenue target for FY94.
2/ Estimated average current yield after May 1991.
3/ Escalated to FY94 prices, a 38.00% increase.

Exhibit 7-9A

Proposed Tariffs for EEA Sales *

Consumer/ Category	Service Voltage	Demand Charge (LE/kW/Month)	Energy Charge (P/kWh) Peak	Off-Peak
KIMA	VHV	0.0	6.50	6.50
ALUMINUM	VHV	0.0	9.00	9.00
ASSUIT CEMENT [1]	VHV	0.0	10.00	10.00
ASSUIT CEMENT [2]	VHV	0.0	10.00	10.00
FERROCILICON	VHV	0.0	10.00	10.00
SOMED	VHV	0.0	10.00	10.00
IRON & STEEL	VHV	0.0	10.00	10.00
AMIRIA SPINING	VHV	0.0	10.00	10.00
Industry and Agriculture	HV	0.0	13.80	13.80
Industry and Agriculture	MV	0.0	15.00	15.00
Distribution Companies				
CAIRO		0.0	10.10	10.10
ALEX		0.0	8.80	8.80
NORTH DELTA		0.0	7.40	7.40
SOUTH DELTA		0.0	8.10	8.10
EL BEHERA		0.0	9.80	9.80
AL CANAH		0.0	7.80	7.80
NORTH UPPER EGYPT		0.0	5.90	5.90
SOUTH UPPER EGYPT		0.0	8.20	8.20

* Until such time as TOD tariffs are implemented

Exhibit 7-10A
Bill Impacts: EEA Tariffs

Consumer/ Category	Sales 1990 July-Dec (Million kWh)	Average Price (P/kWh) Present	Average Price (P/kWh) Proposed	Increase (% Change)
KIMA	824	1.70	6.50	282%
ALUMINUM	1,485	4.60	9.00	96%
ASSUIT CEMENT [1]	86	6.32	10.00	58%
ASSUIT CEMENT [2]	59	6.32	10.00	58%
FERROCILICON	153	5.77	10.00	73%
SOMED	162	6.32	10.00	58%
IRON & STEEL	449	6.32	10.00	58%
AMIRIA SPINING	53	6.32	10.00	58%
Subtotal	3,271	4.35	8.66	99%
Industry/Agriculgure - HV	1,218	8.07	13.80	71%
Industry/Agriculgure - MV	126	13.60	15.00	10%
Distribution Companies				
CAIRO	6,449	6.75	10.10	50%
ALEX	1,619	6.45	8.80	36%
NORTH DELTA	1,099	4.85	7.40	53%
SOUTH DELTA	1,158	5.05	8.10	60%
EL BEHERA	716	6.50	9.80	51%
AL CANAH	1,548	6.60	7.80	18%
NORTH UPPER EGYPT	1,008	4.70	5.90	26%
SOUTH UPPER EGYPT	1,018	6.50	8.20	26%
Subtotal	14,615	6.25	8.91	43%
TOTAL	19,229	6.09	9.22	51%

Exhibit 7-12A
Proposed Residential Tariff Design (Effective FY 93)

Block		New Tariff (P/kWh)
Starting kWh	Ending kWh	
0	100	5.00
101	250	12.00
251	600	18.00
601	1,000	20.00
1,001		22.00

Exhibit 7-13A
Typical Bill Impacts: Residential Tariff

Consumption (kWh/Month)	Bill Present (LE/Month)	Bill Proposed (LE/Month)	Change (LE/Month)	Change (%)	Cumulative Bills (%)
50	1.50	2.50	1.00	66.7%	43.5%
60	1.80	3.00	1.20	66.7%	48.7%
70	2.10	3.50	1.40	66.7%	52.7%
80	2.40	4.00	1.60	66.7%	56.5%
90	2.70	4.50	1.80	66.7%	60.0%
100	3.00	5.00	2.00	66.7%	63.7%
150	5.25	11.00	5.75	109.5%	78.2%
200	7.50	17.00	9.50	126.7%	86.7%
250	10.75	23.00	12.25	114.0%	91.3%
300	14.00	32.00	18.00	128.6%	93.8%
350	17.25	41.00	23.75	137.7%	95.7%
400	21.00	50.00	29.00	138.1%	97.0%
450	24.75	59.00	34.25	138.4%	97.8%
500	28.50	68.00	39.50	138.6%	98.4%
750	55.50	116.00	60.50	109.0%	99.5%
1,000	89.50	166.00	76.50	85.5%	99.8%
2,000	249.50	386.00	136.50	54.7%	100.0%
3,000	424.50	606.00	181.50	42.8%	100.0%
4,000	599.50	826.00	226.50	37.8%	100.0%
5,000	784.50	1046.00	261.50	33.3%	100.0%

Exhibit 7-15A
Proposed Commercial Tariff Design (Effective FY 93)

Block		New Tariff (r/kWh)
Starting kWh	Ending kWh	
0	100	10.00
101	250	15.00
251	600	19.00
601	1,000	21.00
>1,001		23.00

Exhibit 7-16A
Typical Bill Impacts: Commercial Tariff

Consumption (kWh/Month)	Bill Present (LE/Month)	Bill Proposed (LE/Month)	Change (LE/Month)	Change (%)	Cumulative Bills (%)
50	2.25	5.00	2.75	122.2%	--
60	2.70	6.00	3.30	122.2%	--
70	3.15	7.00	3.85	122.2%	--
80	3.60	8.00	4.40	122.2%	--
90	4.05	9.00	4.95	122.2%	--
100	4.50	10.00	5.50	122.2%	77.4%
150	6.75	17.50	10.75	159.3%	77.4%
200	10.00	25.00	15.00	150.0%	89.0%
250	13.25	32.50	19.25	145.3%	89.0%
300	16.50	42.00	25.50	154.5%	89.0%
350	21.40	51.50	30.10	140.7%	94.9%
400	26.30	61.00	34.70	131.9%	94.9%
450	31.20	70.50	39.30	126.0%	94.9%
500	37.70	80.00	42.30	112.2%	96.9%
750	70.20	132.50	62.30	88.7%	96.9%
1,000	107.70	185.00	77.30	71.8%	98.9%
2,000	292.70	415.00	122.30	41.8%	99.6%
3,000	477.70	645.00	167.30	35.0%	99.6%
4,000	687.70	875.00	187.30	27.2%	99.9%
5,000	897.70	1105.00	207.30	23.1%	99.9%

Exhibit 7-18A
Proposed Tariff Structure: Large Power Service

Service Voltage	Demand Charge (LE/kW/month)*	Energy Charge (P/kWh)
MV	6.50	15.00

*Non-coincident demand

Exhibit 7-19A
Typical Bill Impacts: Large Power Service

Customer Demand (kW)	Consumption (MWh/Month)	Monthly Load Factor	Bill (LE/Month) Present	Proposed	Percent Change
500	73	0.2	13,701	14,200	4%
	110	0.3	18,016	19,675	9%
	146	0.4	21,796	25,150	15%
	183	0.5	24,673	30,625	24%
	292	0.8	32,339	47,050	45%
700	102	0.2	19,181	19,880	4%
	153	0.3	25,222	27,545	9%
	204	0.4	30,515	35,210	15%
	256	0.5	34,542	42,875	24%
	409	0.8	45,275	65,870	45%
1,000	146	0.2	27,401	28,400	4%
	219	0.3	36,031	39,350	9%
	292	0.4	43,593	50,300	15%
	365	0.5	49,345	61,250	24%
	584	0.8	64,678	94,100	45%
2,000	292	0.2	54,803	56,800	4%
	438	0.3	72,062	78,700	9%
	584	0.4	87,186	100,600	15%
	730	0.5	98,691	122,500	24%
	1,168	0.8	129,356	188,200	45%

Exhibit 7-21A
Proposed Tariff Structure: Medium Power Service

Customer Type	Demand Charge (LE/kW/Month)	Energy Charge (P/kWh)
Agriculture (Private, Investment)	--	11.80
Industry (Private, Investment)	--	21.10
Public Sector	--	21.10

Exhibit 7-22A
Typical Bill Impacts: Medium Power Service

	Consumption (kWh/Month)	Bill (LE/Month) Present	Proposed	Percent Change
Agriculture	10,000	680.8	2,058.0	202%
	20,000	1,265.8	4,116.0	225%
	40,000	2,411.8	8,232.0	241%
	60,000	3,557.8	12,348.0	247%
	80,000	4,703.8	16,464.0	250%
	100,000	5,849.8	20,580.0	252%
	120,000	6,995.8	24,696.0	253%
	140,000	8,141.8	28,812.0	254%
	160,000	9,287.8	32,928.0	255%
	180,000	10,433.8	37,044.0	255%
	200,000	11,579.8	41,160.0	255%
Industry	10,000	943.1	2,058.0	118%
	20,000	1,753.8	4,116.0	135%
	40,000	3,341.8	8,232.0	146%
	60,000	4,929.8	12,348.0	150%
	80,000	6,517.8	16,464.0	153%
	100,000	8,105.8	20,580.0	154%
	120,000	9,693.8	24,696.0	155%
	140,000	11,281.8	28,812.0	155%
	160,000	12,869.8	32,928.0	156%
	180,000	14,457.8	37,044.0	156%
	200,000	16,045.8	41,160.0	157%
Public Sector	10,000	1,565.3	2,058.0	31%
	20,000	2,911.8	4,116.0	41%
	40,000	5,549.8	8,232.0	48%
	60,000	8,187.8	12,348.0	51%
	80,000	10,825.8	16,464.0	52%
	100,000	13,463.8	20,580.0	53%
	120,000	16,101.8	24,696.0	53%
	140,000	18,739.8	28,812.0	54%
	160,000	21,377.8	32,928.0	54%
	180,000	24,015.8	37,044.0	54%
	200,000	26,653.8	41,160.0	54%

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Exhibit 7-23A
Proposed Tariff Structure: Small Power Service

Service Voltage	Demand Charge (LE/kW/month)*	Energy Charge (P/kWh)
LV	--	22.00

Exhibit 7-24A
Typical Bill Impacts: Small Power Service

Consumption (kWh/Month)	Bill (LE/Month) Present	Proposed	Percent Change
1,500	254	330	29.9%
2,000	339	440	29.9%
3,000	508	660	29.9%
4,000	678	880	29.9%
5,000	847	1,100	29.9%
6,000	1,011	1,320	30.5%
7,000	1,150	1,540	33.9%
8,000	1,288	1,760	36.6%
9,000	1,427	1,980	38.8%
10,000	1,565	2,200	40.6%
15,000	2,252	3,300	46.5%
20,000	2,912	4,400	51.1%
25,000	3,571	5,500	54.0%
30,000	4,231	6,600	56.0%
35,000	4,890	7,700	57.5%
40,000	5,550	8,800	58.6%

Exhibit 7-25A
Proposed Tariff Structures: Free Zone Tariffs (Effective FY 93)

Tariff Category	Service Voltage	Option	Demand Charge (LE/kW/month)	Energy Charge (P/kWh)
1. Free Zone Large Power Service (> 500 kW)	VHV	1	8.99	7.30
		2	--	8.62
	HV	1	9.39	11.60
		2	--	13.38
	MV	1	16.63	12.70
		2	6.50	15.00
2. Free Zone Medium Power Service (≥ 100 kW, but < 500 kW)	LV	1	4.16	20.60
		2	--	21.10
3. Free Zone Small Power Service (< 100 kW)	LV	--	--	22.00

Exhibit 7-26A
Proposed Street Lighting Tariff (Effective FY 93)

Demand Charge (LE/kW/month)	Energy Charge (P/kWh)
--	22.07

Exhibit 7-27A
Proposed Tariff for Sales for Resale (Effective FY 93)

Demand Charge (LE/kW/month)	Energy Charge (P/kWh)
--	10.56

Exhibit 9-16A
Proposed Tariffs for EEA Sales[1]
TOD Option 1: Pure Energy Tariff Option

Consumer/ Category	Service Voltage	Demand Charge (LE/kWh/Month)	Energy Charge (P/kWh) Peak	Off-Peak
KIMA	VHV	0.0	8.62	8.62
ALUMINUM	VHV	0.0	8.62	8.62
ASSUIT CEMENT [1]	VHV	0.0	8.62	8.62
ASSUIT CEMENT [2]	VHV	0.0	8.62	8.62
FERROCILICON	VHV	0.0	8.62	8.62
SOMED	VHV	0.0	8.62	8.62
IRON & STEEL	VHV	0.0	8.62	8.62
AMIRIA SPINING	VHV	0.0	8.62	8.62
Industry and Agriculture	HV	0.0	30.50	9.10
Industry and Agriculture	MV[2]	0.0	36.00	11.00
Distribution Companies [3]				
CAIRO		0.0	8.78	8.78
ALEX		0.0	8.78	8.78
NORTH DELTA		0.0	8.78	8.78
SOUTH DELTA		0.0	8.78	8.78
EL BEHERA		0.0	8.78	8.78
AL CANAH		0.0	8.78	8.78
NORTH UPPER EGYPT		0.0	8.78	8.78
SOUTH UPPER EGYPT		0.0	8.78	8.78

1) Until such time as TOD tariffs are implemented
2) Same as Large Power Service
3) Option 2: Apply same transfer price to all DCs at 8./8 P/kWh and establish price stabilization fund for cross-subsidization.

Exhibit 9-17A
Bill Impacts: EEA TOD Option 1

Consumer/ Category	Sales 1990 July-Dec (Million kWh)	Average Price (P/kWh) Present	Proposed	Increase (% Change)
KIMA	824	1.70	8.62	407%
ALUMINUM	1,485	4.60	8.62	87%
ASSUIT CEMENT [1]	86	6.32	8.62	36%
ASSUIT CEMENT [2]	59	6.32	8.62	36%
FERROCILICON	153	5.77	8.62	49%
SOMED	162	6.32	8.62	36%
IRON & STEEL	449	6.32	8.62	36%
AMIRIA SPINING	53	6.32	8.62	36%
Subtotal	3,271	4.35	8.62	98%
Industry/Agriculgure - HV	1,218	8.07	13.38	66%
Industry/Agriculgure - MV	126	13.60	16.50	21%
Distribution Companies				
CAIRO	6,449	6.75	8.78	30%
ALEX	1,619	6.45	8.78	36%
NORTH DELTA	1,099	4.85	8.78	81%
SOUTH DELTA	1,158	5.05	8.78	74%
EL BEHERA	716	6.50	8.78	35%
AL CANAH	1,548	6.60	8.78	33%
NORTH UPPER EGYPT	1,008	4.70	8.78	87%
SOUTH UPPER EGYPT	1,018	6.50	8.78	35%
Subtotal	14,615	6.25	8.78	40%
TOTAL	19,229	6.09	9.09	49%

Exhibit 9-18A
Proposed Tariff for EEA Sales
TOD Option 2: Demand and Energy Charge

Customer/ Category	Service Voltage	Demand Charge (LE/kW/Month)*	Energy Charge (P/kWh)	
			Peak	Off-Peak
--	HV	18.00	13.00	9.10
--	MV	20.00	15.50	11.00

* coincident demant

Exhibit 9-19A
Large Power Service: TOD Tariff Options

Option	Demand Charge (LE/kW/Month)*	Energy Charge (P/kWh)	
		Peak	Off-Peak
1. LPS-TOD1	20.00	15.50	11.00
2. LFS-TOD2	--	36.00	11.00

* coincident demand

FINANCIAL IMPLICATIONS OF "LOW LRMC CASE" (CASE EEA-YLR3)

The following comments relate to the tariffs derived from the Long Run Marginal Cost Analysis (at a 6 percent discount rate) which are as follows:

	Milliemes/kWh			
	1993	1994	1995	1996
EEA Average Tariff	90.9	121.3	148.7	175.1
EEA Tariff to EDA	87.8	121.9	151.4	180.1
EDA Average Tariff	137.2	182.9	224.3	264.2
System Average Tariff	123.1	164.1	201.2	237.0

Financial Implications for EEA

This case is even less viable than is the case based on LRMC at a 10 percent discount rate. The self-financing ratio is negative in all forecast years, resulting in -41.4 percent in 1996. EEA's cash requirements would result in LE 17.0 billion by 1996.

Financial Implications for EDA

Similarly, for EDA, the comparison is also adverse. EDA's overdraft would amount to LE 3.9 billion by year-end 1996, on the basis of the tariffs shown above.

Detailed results of the financial simulations for the Low LRMC Case can be found in the following tables.

COMPUTATION OF INDIVIDUAL DISTRIBUTION COMPANY PURCHASE TARIFFS FROM EEA
(LE'000)

PURCHASE TARIFF DETERMINATION	YEAR -- 1993									UNDISTR-IBUTED DIFRC.	% OF TOTAL E EDA
	EDA TOTAL	CAIRO	ALEX.	CANAL	BEHIRA	S.U.E.	N.U.E.	S.DELTA	N.DELTA		
Energy Sales - Gwh	31415.9	13935.0	3278.2	3274.2	1509.2	2270.2	2258.7	2593.8	2296.5	0	0.00%
Av Tariff - LE/kwh	0.139	0.144	0.146	0.144	0.160	0.136	0.123	0.124	0.125		
REVENUES											
- Electricity Sales	4363957	2012769	479086	472359	242120	308249	276699	320860	287729	35913	0.82%
- Service Revenues											
- Connection Fees											
Total	4363957	2012769	[illegible]086	472359	242120	308249	276699	320860	287729	35913	0.82%
Less:											
EXPENSES (excl. electricity purchases):											
- Materials	439021	196270	54910	62832	21458	30466	33567	19729	19790	0	0.00%
- Services	93460	42544	13095	11472	4273	5602	8988	3981	3504	0	0.00%
- Wages	374235	110585	38376	56682	20733	31907	56821	27495	31636	0	0.00%
- Others	5459	1058	902	1311	443	477	504	339	424	0	0.00%
- Depreciation	92746	18879	20853	12264	4307	8098	9201	10107	9036	0	0.00%
- Pro-Rata Income from Operations	269398	124253	29575	29160	14947	19029	17081	19807	17762	2217	0.82%
Total	1274319	493590	157712	173720	66161	95578	126163	81459	82152	2217	0.17%
PURCHASES OF ELECTRICITY	3089638	1519180	321374	298638	175960	212670	150535	239401	205576	33696	1.09%
System Losses -- %	10.7237%	7.0579%	10.4271%	14.2479%	15.9211%	13.0520%	11.4270%	12.7699%	17.6521%		
# of GWH purchased	35189.5	14993.2	3659.8	3818.2	1794.9	2611.0	2550.1	2973.5	2788.8	0	
AVERAGE PURCHASE TARIFF FROM EEA (EL milliemes/kwh)	87.8	101.3	87.8	78.2	98.0	81.5	59.0	80.5	73.7		
"CROSS-SUBSIDISATION" BY EEA -- LE '000		-202777	-43	36601	-18364	16574	73363	21674	39278	-33693	
-- %										-1.10%	

NOTES:

1) The BASIS of the computation is that each individual DC will earn the same pro-rata Income from Operations as a percentage of Electricity Sales Revenues as does EDA in total.

2) The NET SUBSIDISATION by EEA is shown as the Undistributed Difference in the "Cross-subsidisation" line.
A POSITIVE figure indicates net cross-subsidisation BY EEA relative to the target average EEA sales tariff to EDA.
A NEGATIVE figure indicates NET IMPROVEMENT in revenues to EEA relative to the target average sales tariff to EDA.

This "Undistributed Difference" occurs as a result of the relative mix of estimated sales revenues in the DC's being slightly different from the forecast composite. It can be eliminated by adjusting the EEA tariff to each DC by the Percentage shown.

EGYPTIAN ELECTRICITY SYSTEM

TABULATION OF KEY RESULTS

Date: 18-Sep
EEA FILE EEAYLR3
EDA FILE EDAYLR3

Year end June 30	Est. 1991	Forecast 1992	1993	1994	1995	1996
1 Border Price -- Mazout -- $/Tonne	70.1	64.7	74.7	84.2	86.7	90.5
LE/Tonne	231.4	279.0	369.0	450.6	482.2	511.1
2 Exchange Rate	3.300	4.310	4.940	5.350	5.560	5.650
3 Mazout Transfer Price to EEA						
--LE/Tonne	55.0	83.7	184.5	283.9	385.7	511.1
4 Gas Transfer Price to EEA						
--LE/Tonne	66.0	98.3	184.5	283.9	385.7	511.1
5 Mazout price to EEA as % Mazout Border Price	23.8%	30.0%	50.0%	63.0%	80.0%	100.0%
Gas price to EEA as % Mazout Border Price	28.5%	35.2%	50.0%	63.0%	80.0%	100.0%
6 Target Self-finacing Ratio (WB) - %	0.0%	20.0%	30.0%	35.0%	35.0%	35.0%
7 Self-financing Ratio -- WB Definition	-32.9%	-39.2%	-9.5%	-15.0%	-26.4%	-54.8%
-- RCG Definition	-11.0%	-29.6%	-0.3%	-2.8%	-13.6%	-41.4%
8 Revenue Requirement for Above Assumptions (Milliemes / kwh)						
-- EEA Requirement	43.1	59.5	90.9	121.3	148.7	175.1
-- EDA Requirement	70.2	91.4	130.1	178.1	219.9	260.4
-- System Requirement	61.6	81.2	123.1	164.1	201.2	237.0
9 % Real Increase Required						
-- EEA		38.2%	52.8%	33.4%	22.6%	17.8%
-- EDA		30.1%	42.3%	36.9%	23.5%	18.4%
-- System		31.9%	51.5%	33.3%	22.6%	17.8%

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case # EEAYLR3

EGYPTIAN ELECTRICITY AUTHORITY

INPUT ASSUMPTIONS

	Actual					Est.	Forecast				
	1987	1988	1989	1990	Year end June 30	1991	1992	1993	1994	1995	1996
1	1.350	2.310	2.599	2.750	Exchange Rate -- L.E./US$	3.300	4.310	4.940	5.350	5.560	5.650
2				3.70%	Inflation Rate -- International %	8.70%	6.20%	2.20%	1.70%	2.50%	3.10%
3				15.00%	-- Egyptian %	20.00%	20.00%	15.00%	9.00%	6.00%	5.00%
4			0.8868	0.9200	Inflation Index -- International	1.0000	1.0620	1.0854	1.1038	1.1314	1.1665
5			0.7246	0.8333	Inflation Index -- Egyptian	1.0000	1.2000	1.3800	1.5042	1.5945	1.6742
6	4.00%	4.31%	4.53%	4.08%	Station Losses -- %	4.10%	4.10%	4.10%	4.10%	4.10%	4.10%
7	7.64%	7.72%	7.16%	6.31%	System Losses -- %	6.16%	5.86%	5.33%	5.00%	4.80%	4.44%
8					International Fuel Prices ($/MBTU) --						
9			4.69	4.69	-- Distillate	4.14	3.93	4.18	4.37	4.51	4.71
10			2.43	2.43	-- Residual	1.69	1.56	1.80	2.03	2.09	2.18
11			2.43	2.43	-- Natural Gas	1.69	1.56	1.80	2.03	2.09	2.18
12			1.80	1.80	-- Coal	1.80	1.80	1.80	1.80	1.80	1.80
13					* IF INFLATION IS TO BE PUT INTO *	******* *					
14					* FORECAST, INSERT "1" HERE >>>>>>	1	<<<<<< OTHERWISE, SET AT "0"				
15						******* *					
16					Interest Rate on New FX Loans -%	7.00%	*******	*******	*******	*******	********
17					Interest Rate on New EL Loans -%	11.25%	*******	*******	*******	*******	********
18	5.0%	3.3%	3.7%	3.5%	Depreciation Expense Rate %	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
19	136	151	168	167	Customer Accts Rec. -- days' sales	160	110	90	90	90	90
20	149	102	110	83	Other Accts Rec. -- days' sales	48	30	18	12	10	8
21	6.4%	5.9%	7.0%	6.3%	Inventories -- % of G F A	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
22					TARGET SELF-FINANCING RATIO % (WB)		20.0%	30.0%	35.0%	35.0%	35.0%
23					EEA Fuel Price as % Int'l Price	26.8%	43.8%	50.0%	63.0%	80.0%	100.0%

case # EEAYLR3

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED INCOME STATEMENT
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1											
2	35202	37847	39583	41649	Gross Generation(Gwh)	44297	47201	49947	52921	56155	59311
3	33794	36216	37790	39950	Net Energy Sent Out(Gwh)	42481	45266	47899	50751	53852	56879
4	31212	33420	35084	37429	Net Energy Sold(Gwh)	39864	42612	45346	48213	51267	54352
5	16.4	22.0	24.0	30.5	Average Tariff (Millimes/Kwh)	43.1	59.5	90.9	121.3	148.7	175.1
6											
7											
8											
9					OPERATING REVENUE						
10	513.2	734.9	840.4	1,142.9	Sales of Electricity	1,716.8	2,535.4	4,121.9	5,848.3	7,623.5	9,517.0
11	0.2	0.4	0.9	0.9	Other operating Revenue						
12											
13	513.5	735.3	841.3	1,143.8	TOTAL OPERATING REVENUE	1,716.8	2,535.4	4,121.9	5,848.3	7,623.5	9,517.0
14											
15					OPERATING EXPENSES						
16	147.5	256.1	265.9	330.8	Fuel @ Base Year	552.8	904.2	1,268.1	1,913.9	2,662.2	3,671.2
17					Inflation			792.3	1,511.1	2,412.7	3,660.8
18					Total	552.8	904.2	2,060.4	3,425.0	5,074.9	7,332.0
19		0.7	0.4	1.6	Purchases from Sales @ Base Year	1.5	1.5	1.5	1.5	1.5	1.5
20					Inflation	(0.0)	0.3	0.6	0.8	0.9	1.0
21					Total	1.5	1.9	2.1	2.3	2.5	2.6
22	48.3	58.1	69.5	82.3	Salaries & Wages (Operation only)	90.7	93.3	100.5	105.0	111.0	116.0
23					Inflation	(0.0)	18.7	38.2	52.9	66.0	78.2
24					Total	90.7	111.9	138.7	157.9	177.0	194.2
25	80.6	62.1	112.0	138.2	Materials & Services Input	158.3	164.0	178.1	187.0	199.4	208.4
26					Inflation	(0.0)	32.8	67.7	94.3	118.5	140.5
27					Total	158.3	196.8	245.7	281.3	317.9	348.9
28	38.2	42.7	52.1	60.9	Other Operating Expenses(Admin)	67.1	71.3	75.9	80.8	86.1	90.3
29					Inflation	(0.0)	14.3	28.8	40.7	51.2	60.9
30					Total	67.1	85.6	104.7	121.5	137.3	151.1
31	152.8	133.1	180.3	243.2	Depreciation -- Historical	253.3	282.9	338.2	425.8	540.2	671.0
32					-- Revaluation	285.8	446.6	721.6	897.0	1,026.0	1,124.0
33	152.8	133.1	180.3	243.2	Total	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
34											
35	467.3	552.8	680.3	857.0	TOTAL OPERATING EXPENSES	1,409.5	2,029.9	3,611.6	5,310.9	7,275.8	9,823.8
36											
37											
38	46.2	182.5	161.1	286.8	INCOME FROM OPERATIONS	307.3	505.5	510.4	537.4	347.6	(306.9)
39											
40	148.7	247.1	284.3	432.1	Gross Interest	580.6	880.7	1,359.2	1,907.3	2,440.6	2,955.6
41	34.5	76.0	116.3	168.9	Interest During Construction	121.0	211.1	508.0	708.6	764.7	701.2
42											
43	114.2	171.1	168.1	263.2	NET INTEREST EXPENSE	459.7	669.6	851.2	1,198.7	1,675.9	2,254.3
44											
45											
46	(68.0)	11.5	(7.0)	23.6	NET OPERATING INCOME	(152.4)	(164.0)	(340.8)	(661.4)	(1,328.3)	(2,561.2)
47											
48	103.1	51.0	82.4	88.4	Non-Operating Income	85.0	85.0	85.0	85.0	85.0	85.0
49	22.0	49.1	51.4	87.9	Less:Non-operating Expenses	75.0	75.0	75.0	75.0	75.0	75.0
50											
51	81.1	2.0	31.0	0.5	Net Non-Operating Income(Loss)	10.0	10.0	10.0	10.0	10.0	10.0
52											
53	13.0	13.4	24.0	24.1	NET INCOME(LOSS)	(142.4)	(154.0)	(330.8)	(651.4)	(1,318.3)	(2,551.2)

case # EEAYLR3

EGYPTIAN ELECTRICITY AUTHORITY
PROJECTED BALANCE SHEET
(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					ASSETS						
2					FIXED ASSETS						
3	3,082.0	4,090.2	4,896.0	6,928.4	Gross Fixed Assets in Service	20,304.9	29,240.8	36,335.2	42,941.9	49,357.7	55,567.7
4	629.8	746.6	924.9	1,166.6	Less – Accumulated Depreciation	6,119.2	8,072.5	10,343.3	12,597.1	14,919.1	17,460.1
5											
6	2,452.2	3,343.6	3,971.1	5,762.8	Net Fixed Assets in Service	14,185.7	21,168.3	25,991.9	30,344.9	34,438.6	38,107.6
7	1,054.7	1,661.0	2,537.0	2,468.9	Capital Work-in-Progress	4,308.7	8,331.5	11,688.4	14,458.0	15,424.6	15,889.2
8											
9	3,506.9	5,004.6	6,508.1	8,231.6	TOTAL NET FIXED ASSETS	18,494.4	29,499.8	37,680.3	44,802.9	49,863.1	53,996.7
10											
11		1,544.0	1,544.0	1,544.0	RESERVE FOR FOREIGN DEBT	2,643.9	4,917.7	6,670.3	7,998.5	8,762.8	9,111.5
12											
13	53.5	56.5	56.5	56.5	INVESTMENTS	56.5	56.5	56.5	56.5	56.5	56.5
14											
15	36.1	105.7	131.4	173.0	LONG TERM RECEIVABLES	176.6	176.9	176.9	176.9	176.9	176.9
16											
17					CURRENT ASSETS						
18	165.9	139.3	134.5	192.5	Cash	0.0	0.0	0.0	0.0	0.0	0.0
19	197.0	242.1	344.0	433.6	Inventories	1,015.2	1,462.0	1,816.8	2,147.1	2,467.9	2,778.4
20	191.5	305.0	387.9	524.3	Customer Accts. Receivable	752.6	764.1	1,016.4	1,442.0	1,879.8	2,346.7
21	210.1	204.4	253.0	260.3	Other Accounts Receivable	225.0	210.0	200.0	200.0	200.0	200.0
22											
23	764.4	890.9	1,119.5	1,410.7	TOTAL CURRENT ASSETS	1,992.8	2,436.1	3,033.1	3,789.1	4,547.6	5,325.0
24											
25	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL ASSETS	23,364.5	37,087.0	47,617.1	56,823.9	63,407.0	68,666.6
26											
27											
28					LIABILITIES AND EQUITY						
29					EQUITY						
30	651.0	651.0	651.0	1,570.0	Capital	1,570.0	2,770.0	2,770.0	2,770.0	2,770.0	2,770.0
31	401.7	409.7	425.8	464.6	Reserves	467.5	467.5	467.5	467.5	467.5	467.5
					Foreign Grants for Fixed Assets	242.9	766.7	1,280.7	1,786.3	2,170.7	2,534.5
32					Reserve for Asset Revaluation	8,344.8	14,979.7	18,780.3	21,534.0	23,579.5	25,187.3
33	4.0	3.3	5.4	5.5	Other Provisions	5.1	5.1	5.1	5.1	5.1	5.1
34	35.7	48.7	62.1	86.1	Retained Earnings – prior years	110.2	(32.2)	(186.2)	(517.0)	(1,168.4)	(2,486.7)
35	13.1	13.4	23.9	24.1	Profit (Loss) – current year	(142.4)	(154.0)	(330.8)	(651.4)	(1,318.3)	(2,551.2)
36											
37	1,105.4	1,126.1	1,168.3	2,150.3	TOTAL EQUITY	10,598.1	18,802.7	22,786.5	25,394.6	26,506.0	25,926.5
38											
39					LONG-TERM DEBT						
40	1,428.4	3,277.4	3,739.2	4,839.7	Foreign Long-Term Debt	6,907.8	11,420.6	15,333.5	18,632.2	20,490.6	21,816.2
41	1,103.6	1,489.4	1,922.4	1,600.1	Local Long-Term Debt	309.3	218.5	127.7	90.8	90.8	90.8
42											
43	2,532.0	4,766.9	5,661.6	6,439.9	TOTAL LONG-TERM DEBT	7,217.1	11,639.1	15,461.2	18,723.0	20,581.4	21,907.0
44											
45					CURRENT LIABILITIES						
46	145.6	329.3	423.2	655.0	Foreign Debt due within one year	408.4	569.4	669.6	839.4	1,050.9	1,067.9
47	28.0	52.1	64.5	90.8	Local Debt due within one year	1,290.8	90.8	90.8	36.9	0.0	0.0
48	18.1	23.6	22.3	33.5	Accounts Payable – Suppliers	46.1	75.4	171.7	285.4	422.9	611.0
49	339.9	590.1	870.0	1,189.8	Ministry of Finance	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0	1,200.0
50	147.8	604.3	996.0	739.7	Other Accounts Payable	800.0	800.0	800.0	800.0	800.0	800.0
51	22.8	79.7	106.6	76.3	Deferred Liabilities	75.0	75.0	75.0	75.0	75.0	75.0
52	20.8	25.2	41.2	34.8	Deposits	35.0	35.0	35.0	35.0	35.0	35.0
53	0.0	0.0	2.1	2.1	Provision for Taxes						
54	0.6	4.5	3.6	3.7	Overdraft/Cash Requirement	1,694.0	3,799.6	6,327.3	9,434.7	12,735.8	17,044.2
55											
56	723.6	1,708.8	2,529.5	2,825.7	TOTAL CURRENT LIABILITIES	5,549.3	6,645.2	9,369.4	12,706.4	16,319.6	20,833.1
57											
58	4,361.0	7,601.8	9,359.4	11,415.9	TOTAL LIABILITIES	23,364.5	37,087.0	47,617.1	56,823.9	63,407.0	68,666.6

case # EEAYLR3

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED SOURCES AND USES OF FUNDS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	(Millions of L.E) Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SOURCES OF FUNDS						
2					==========						
3											
4					INTERNAL CASH GENERATION						
5	127.2	184.5	192.0	287.3	Gross Income before Interest	317.3	515.5	520.4	547.4	357.6	(296.9)
6	148.6	116.8	178.3	240.7	Depreciation	539.1	729.5	1,059.9	1,322.9	1,566.2	1,795.0
7											
8	275.9	301.3	370.3	528.0	TOTAL INTERNAL CASH GENERATION	856.3	1,245.1	1,580.2	1,870.2	1,923.9	1,498.1
9											
10					EXTERNAL SOURCES						
11	0.0	0.0	0.0	919.0	Increase in Equity Capital	0.0	1,200.0	0.0	0.0	0.0	0.0
12	129.8	7.3	18.2	38.9	Change in Reserves & Provisions	2.5	0.0	0.0	0.0	0.0	0.0
					Foreign Grants	242.9	523.7	514.0	505.6	384.3	363.8
13											
14	238.6	2,163.3	887.6	1,692.6	New Long Term Debt — Foreign	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
15	267.6	420.4	495.2	(167.6)	New Long Term Debt — Local	0.0	0.0	0.0	0.0	0.0	0.0
16											
17	506.2	2,583.7	1,382.8	1,524.9	Total New Long Term Debt	1,376.6	2,967.8	2,912.9	2,865.2	2,177.8	2,061.7
18											
19	911.9	2,892.3	1,771.4	3,010.8	TOTAL SOURCES OF FUNDS	2,478.3	5,936.6	5,007.2	5,241.1	4,486.0	3,923.6
20											
21					APPLICATIONS OF FUNDS						
22					==========						
23											
24	498.2	3,158.5	1,681.7	1,964.3	CAPITAL EXPENDITURES (Incl.IDC)	2,457.1	5,100.0	5,439.8	5,691.7	4,581.0	4,320.7
25											
26					DEBT SERVICE						
27	121.3	130.7	331.9	360.3	Foreign Debt Repayment	655.0	567.9	652.5	725.0	872.1	1,067.7
28	44.6	10.4	49.8	128.3	Local Debt Repayment	90.8	1,290.8	90.8	90.8	36.9	0.0
29	114.2	171.1	168.1	263.2	Interest (Net of IDC)	459.7	669.6	851.2	1,198.7	1,675.9	2,254.3
30											
31	280.1	312.2	549.8	751.7	TOTAL NET DEBT SERVICE	1,205.5	2,528.2	1,594.4	2,014.6	2,585.0	3,322.0
32											
33	0.0	3.0	0.0	0.0	INCREASE IN INVESTMENTS	0.0	0.0	0.0	0.0	0.0	0.0
34											
35	(3.0)	69.6	25.7	41.6	INCREASE IN LONG TERM RECEIVABLES	3.9	0.0	0.0	0.0	0.0	0.0
36											
37	121.7	(620.6)	(481.9)	195.2	NET INCHEASE IN WORKING CAPITAL	694.7	414.0	500.6	642.3	621.0	589.3
38					(Excluding Cash, Overdraft,LTD)						
39											
40	897.0	2,922.7	1,775.4	2,952.9	TOTAL APPLICATIONS OF FUNDS	4,361.2	8,042.2	7,534.8	8,348.6	7,787.0	8,232.1
41											
42	14.8	(30.4)	(4.0)	58.0	NET CHANGE IN CASH	(1,882.8)	(2,105.6)	(2,527.6)	(3,107.5)	(3,301.1)	(4,308.5)
43											
44	150.5	165.3	134.9	130.9	OPENING CASH	188.8	(1,694.1)	(3,799.6)	(6,327.3)	(9,434.7)	(12,735.8)
45											
46	165.3	134.9	130.9	188.8	CLOSING CASH	(1,694.1)	(3,799.6)	(6,327.3)	(9,434.7)	(12,735.8)	(17,044.2)

case # EEAYLR3

EGYPTIAN ELECTRICITY AUTHORITY

PROJECTED TRENDS AND RATIOS

(At Inflated Prices)

	Actual 1987	Actual 1988	Actual 1989	Actual 1990	Year end June 30	Est. 1991	Forecast 1992	Forecast 1993	Forecast 1994	Forecast 1995	Forecast 1996
1					SALES						
2											
3		7.07%	4.98%	6.68%	Energy Sales(Gwh)–Annual Growth –%	6.51%	6.89%	6.42%	6.32%	6.33%	6.02%
4		43.19%	14.36%	35.99%	Sales Revenue(EL)–Annual Growth –%	50.21%	47.68%	62.58%	41.88%	30.35%	24.84%
5											
6	16.4	22.0	24.0	30.5	Average Tariff —EL mills/kwh	43.1	59.5	90.9	121.3	148.7	175.1
7											
8					OPERATING RATIOS						
9											
10	28.7%	34.8%	31.6%	28.9%	Fuel Cost to Sales – %	32.2%	35.7%	50.0%	58.6%	66.6%	77.0%
11	9.0%	24.8%	19.2%	25.1%	Operating Income to Sales – %	17.9%	19.9%	12.4%	9.2%	4.6%	–3.2%
12					Operating Income to Gross Assets						
13					In Service (Average) – %:						
14	2.5%	4.3%	3.0%	4.1%	–historical	6.7%	9.2%	9.9%	9.2%	7.0%	3.4%
15					–revalued	1.6%	1.9%	1.4%	1.2%	0.7%	–0.5%
16					Net Income to Equity – %:						
17	2.3%	1.2%	2.1%	1.5%	–historical	6.5%	9.6%	10.0%	6.2%	–8.6%	–77.9%
18					–revalued	–2.2%	–1.0%	–1.6%	–2.7%	–5.1%	–9.7%
19											
20					CASH FLOW RATIOS						
21											
22	0.0%	35.2%	13.4%	–20.5%	Self-Financing Ratio (WB)– %	–32.9%	–39.2%	–9.5%	–15.0%	–28.4%	–54.8%
23	0.63	0.81	0.51	0.58	Debt Service Ratio (WB)	0.21	0.31	0.39	0.46	0.48	0.37
		0.3%	–7.8%	–10.9%	Self-Financing Ratio (RCG)– %	–11.0%	–29.6%	–0.3%	–2.8%	–13.6%	–41.4%
24											
25					BALANCE SHEET RATIOS						
26											
27	1.1	0.5	0.4	0.5	Current Ratio	0.4	0.4	0.3	0.3	0.3	0.3
28	3.9	2.3	1.9	2.0	Cash at Bank to Sales – months	–11.8	–18.0	–18.4	–19.4	–20.0	–21.5
29	136	151	168	167	Accts.Receivable to Sales –days	160	110	90	90	90	90
30					Debt to Equity Ratio – %						
31	244.8%	457.2%	526.4%	334.2%	–historical	395.7%	321.7%	404.9%	507.7%	739.2%	3108.1%
32					–revalued	84.1%	65.4%	71.2%	77.2%	81.6%	88.6%

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