

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NATIONAL ELECTRIC POWER CO. (NEPCO)
THE HASHEMITE KINGDOM OF JORDAN

THE STUDY
ON
ELECTRIC POWER LOSS REDUCTION
OF
TRANSMISSION AND DISTRIBUTION NETWORKS
IN
THE HASHEMITE KINGDOM OF JORDAN

FINAL REPORT

APPENDICES

MAY 1997

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TOKYO ELECTRIC POWER SERVICES CO., LTD.

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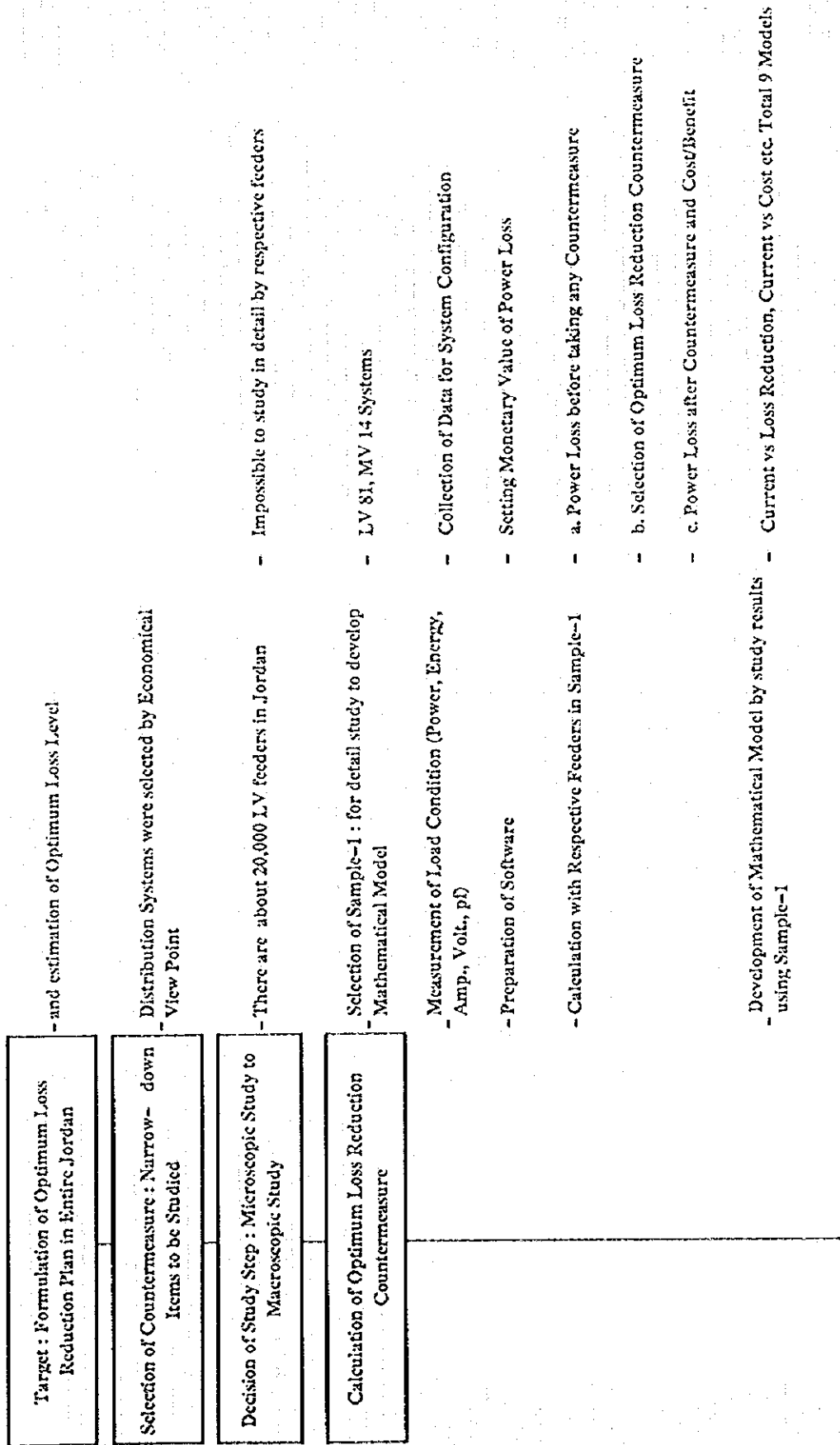
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CHAPTER 1

INTRODUCTION

Appendix I.1 Flow Chart for the Study on Power Loss Reduction of T. & D. Networks in Jordan



Calculation of Loss Reduction and Cost for Entire System

- Selection of Sample-2 : to apply Entire System Study
- LV Feeders connected to randomly selected 2% of Distribution Substation
- MV: All 33 kV feeders in Entire System
- Study on Loss Reduction Countermeasure : applying Mathematical Model
- Improvement of Unbalance, Power factor and New Line Construction

Formulation of Loss Reduction Plan

- LV 100A MV 137A and above, Cost JD 63.57Million
- Capacitor 191MVA, New line construction: LV 6,24s, MV 40 system
- Annual Allocation of Plan
- Study on Alternative Plan
- Calculation of Loss Reduction until 2018
- 1999 to 2008, Bigger B/C has higher priority, about even cost/year
- 5 Alternatives at an interval of about JD 10 million
- Loss Reduction Volumes were assumed to be kept flat from 10 years later at completion by each Project

Economic and Financial Evaluation

- Estimation of Loss Rate in Transmission and Distribution System
- Calculate assumed Optimum Loss Reduction and Loss Rate in 1996 then compare to the values in 2009
- Sensitivity Analysis : Construction Cost, Interest Rate of Foreign Currency
- Cost 30% up. Interest Rate : Based on 2.7 % , 5 and 7 % were also studied

Recommendation and Future Problems to be Solved

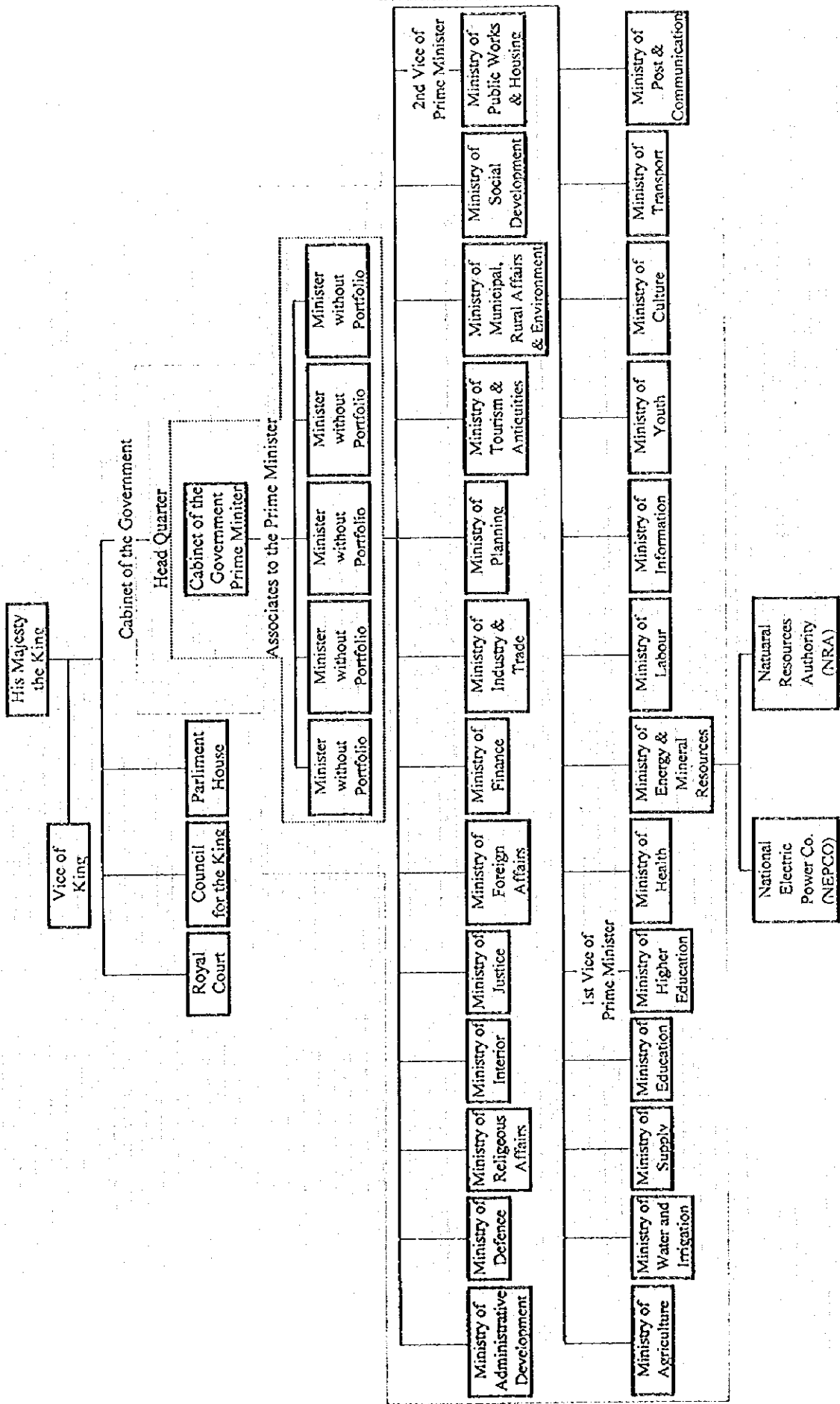
- Execution of Respective Projects:
- Feasibility Study will be necessary before execution Improvement of execution organization

CHAPTER 2

SOCIO-ECONOMIC SCENES OF JORDAN



Appendix 2.1 Organization of the Government of Jordan



Source : Statistical Year Book 1994, Department of Statistics.

Appendix 2.2 Area and Population in the Nation by Census

Governorate/Sub-District	Area (km ²)	Population as of 1994 (persons)	Households as of 1994		Population density (persons/ k m ²)
			(Nos. of HHs)	(Family size per HH)	
Amman Governorate	8,231	1,574,809	279,701	5.63	191
Amman City		713,993			
Marqa		263,474			
Qwasneh		140,709			
University		189,376			
Wadi Alsir		132,195			
Sahab		46,692			
Muaqqar		18,963			
Jozah		32,446			
Na'oor		36,961			
Balqa Governorate	1,076	280,537	43,618	6.43	261
Salt		105,096			
Dair Alla		43,993			
Shoonah Janoobiyyh		33,598			
Ain Al Bash		97,850			
Zarqa Governorate	4,080	640,094	100,713	6.36	157
Zarqa		424,765			
Rosifa		215,329			
Madaba Governorate	2,008	103,183	16,400	6.29	51
Madaba		79,686			
Dieban		23,497			
Irbid Governorate	1,621	747,179	118,472	6.31	461
Irbid		324,980			
Bani Abceed		75,763			
Mazzar Shamaliyyah		35,651			
Koorah		71,513			
Bani kenanah		62,221			
Ramtha		79,304			
Aghwar Shamaliyyah		73,900			
Tayybeh		23,847			
Mafraq Governorate	26,435	178,856	24,974	7.16	7
Mafraq		131,020			
Badya Shamaliyyah		47,836			
Ajlun governorate	412	94,548	14,853	6.37	229
Ajlun		94,548			
Jarash Governorate	402	123,190	18,721	6.58	306
Jarash		123,190			
Karak Governorate	3,217	169,770	26,333	6.45	53
Karak		69,674			
Ghor Janobiyyah		28,030			
Mazar Janoobiyyah		44,964			
Qasar Janoobiyyah		27,102			
Tafiela Governorate	2,114	62,783	9,585	6.55	30
Tafiela		62,783			
Ma'an Governorate	33,163	79,670	12,149	6.56	2
Ma'an		51,676			
Shoabak		10,062			
Wadi Moosa		17,932			
Aqaba Governorate	6,583	79,839	13,740	5.81	12
Aqaba		67,103			
Quairah		12,736			
Total	89,342	4,134,458	679,259	6.09	46

Source : Statistical Year Book 1994, Department of Statistics, October 1995.

Appendix 2.3 Population Projection Since 1980 of the Whole Nation

Year	Male	Female	Total	Remarks
1980	1,158.7	1,056.3	2,215.0	Projection based on 1979 Census for Population & Housing.
1981	1,203.1	1,096.9	2,300.0	
1982	1,249.7	1,139.3	2,389.0	
1983	1,297.8	1,183.2	2,481.0	
1984	1,347.6	1,228.4	2,576.0	
1985	1,399.3	1,275.7	2,675.0	
1986	1,453.1	1,324.9	2,778.0	
1987	1,509.1	1,375.9	2,885.0	
1988	1,566.9	1,429.1	2,996.0	
1989	1,627.0	1,484.0	3,111.0	
1990	1,765.7	1,665.3	3,431.0	
1991	1,889.3	1,773.7	3,663.0	
1992	1,974.1	1,829.9	3,804.0	
1993	2,054.9	1,895.1	3,950.0	
1994	2,135.9	1,959.7	4,095.6	Reported in 1994 Population & Housing Census.
Annual average population growth of the nat			4.49%	

Source:

Statistical Year Book, 1994, Department of Statistics of the Hashemite Kingdom of Jordan, October 1995.

Appendix 2.4 Labour Force Estimates in Jordan

A. By Major Economic Activities	As of 1993 (persons)	
	Major economic activities	Labour force Share rate (%)
Agriculture	54,995	6.4%
Mining and Manufacturing	91,086	10.6%
Electricity and water	6,015	0.7%
Construction	60,151	7.0%
Trade	129,754	15.1%
Transport and communication	57,573	6.7%
Financial and insurance services	24,920	2.9%
Social and administration services	434,806	50.6%
Total	859,300	100.0%

Source : Statistical Year Book 1994, Dep. of Statistics.

B. By Occupation Groups	As of 1993 (persons)	
	Major economic activities	Labour force Share rate (%)
Specialists and technicians	158,970	18.5%
Administrators	20,623	2.4%
Clerks	66,176	7.7%
Salesmen	76,478	8.9%
Services	41,246	4.8%
Agricultures	48,121	5.6%
Productive workers and others	447,686	52.1%
Total	859,300	100.0%

Source : Statistical Year Book 1994, Dep. of Statistics.

Appendix 2.5 Gross Domestic Product (GDP) in Jordan

No	Economic activity	At current prices					At constant prices					Share rate (%)	Annual growth rate (%)		
		Gross Domestic Product (GDP)					Gross Domestic Product (GDP)								
		1989	1990	1991	1992	1993	1989	1990	1991	1992	1993				
A	Industry of origin														
1	Agriculture, hunting, forestry and fishery	139.8	187.8	213.5	246.9	193.3	5.07%	8.44%	124.4	163.1	178.7	209.6	154.3	6.46%	5.53%
2	Mining and quarrying	154.5	148.8	124.9	130.5	106.9	2.80%	-8.80%	77.4	63.6	54.1	53.5	47.4	1.99%	-11.54%
3	Manufacturing	254.7	345.3	343.7	406.3	427.3	11.21%	13.81%	204.4	224.0	220.7	263.7	261.9	10.97%	6.39%
4	electricity and water	52.7	53.9	62.0	66.6	78.7	2.06%	10.55%	69.4	53.3	56.2	58.7	67.1	2.81%	-0.84%
5	Construction	101.5	105.6	125.7	215.3	283.7	7.44%	29.30%	86.1	80.7	89.2	38.6	174.1	7.29%	19.25%
6	Wholesale and retail trade, restaurants and hotels	180.7	216.8	254.7	278.7	317.2	8.32%	15.10%	77.1	57.7	59.0	65.4	82.4	3.45%	1.68%
7	Transport, storage and communications	359.1	362.0	382.7	450.0	487.1	12.78%	7.92%	279.9	270.2	255.1	278.5	289.9	12.14%	0.88%
8	Finance, insurance, real estate and business service	413.8	407.0	472.2	520.4	622.7	16.34%	10.76%	363.8	335.5	369.6	386.2	440.9	18.47%	4.92%
9	Community, social and personal services	45.6	51.1	66.2	86.9	88.8	2.33%	18.13%	29.8	30.9	40.1	49.6	50.6	2.12%	14.15%
	Total	1,702.4	1,878.3	2,045.6	2,401.6	2,605.7	68.37%	11.23%	1,312.3	1,279.0	1,322.7	1,403.8	1,568.6	65.71%	4.56%
B	Producers of Government Services	431.3	449.1	474.4	554.7	619.1	16.24%	9.46%	388.2	386.1	392.6	415.3	451.6	18.92%	3.85%
C	Producers of Private Non-Profit Services to Househ	25.2	30.8	34.0	39.2	48.6	1.28%	17.84%	20.1	22.0	23.1	25.3	30.4	1.27%	10.90%
D	Domestic Services of Households	6.0	6.2	5.3	7.2	7.6	0.20%	6.09%	4.0	3.6	3.1	4.2	4.4	0.18%	2.41%
	Total (A + B + C + D)	2,164.9	2,364.4	2,559.3	3,002.7	3,281.0	86.08%	10.95%	1,724.6	1,690.7	1,741.5	1,848.6	2,055.0	86.08%	4.48%
-	Less: Imputed bank service charge	-55.3	-39.9	-53.7	-41.8	-66.4	-1.74%	4.68%	-44.1	-28.5	-36.5	-27.0	-41.6	-1.74%	-1.45%
	GDP at factor cost	2,109.6	2,324.5	2,505.6	2,960.9	3,214.6	84.34%	11.10%	1,680.5	1,662.2	1,705.0	1,821.6	2,013.4	84.34%	4.62%
+	Indirect taxes less subsidies	262.5	343.8	349.5	532.1	596.8	15.66%	22.79%	209.1	245.8	237.8	343.5	373.8	15.66%	15.63%
	GDP at producers prices	2,372.1	2,668.3	2,855.1	3,493.0	3,811.4	100.00%	12.59%	1,889.6	1,908.0	1,942.8	2,165.1	2,387.2	100.00%	6.02%
+	Net factor income from abroad	-191.4	-239.5	-221.1	-186.2	-149.1	-	-	-	-	-	-	-	-	-
	Gross National Income (GNP) at Market Price														

Source: Statistical Yearbook 1994, Department of Statistics of the Hashemite Kingdom of Jordan, October 1995.

Appendix 2.6 Summary of Central Government Budget During 1990 - 1994

	(Million JDs)				
Items of revenues and expenditures	1990	1991	1992	1993	1994
Revenues	938.2	1,112.0	1,358.7	1,406.3	2,098.7
Domestic revenue ^a	744.0	828.8	1,168.9	1,191.5	1,876.4
Direct tax revenues	176.8	169.3	214.5	231.4	249.5
Income and profit taxes	114.0	92.8	109.5	118.8	136.6
Other taxes	62.8	76.5	105.0	112.6	112.9
Indirect tax revenues	315.3	361.2	600.2	587.3	1,203.8
Custom duties	116.7	136.1	286.4	237.7	222.4
Sales taxes (consumption taxes)	90.4	96.1	138.4	174.3	222.5
Licences	36.3	45.6	70.5	62.0	633.4
Fees	71.9	83.4	104.9	113.3	125.5
Non-tax revenues	251.9	298.3	354.2	372.8	423.1
Post, telegrams and telecommunications	75.0	86.9	120.3	135.9	161.3
Interest and profits	86.4	69.0	67.1	64.5	43.0
Other revenues	90.5	142.4	166.8	172.4	218.8
External aid	164.3	225.2	137.4	163.3	167.3
Loans repaid	29.9	58.0	52.4	51.5	55.0
Expenditures	1,032.6	1,099.6	1,177.7	1,336.6	1,437.1
Current	841.4	904.0	929.5	1,044.3	1,118.5
Civil	586.7	634.3	656.7	744.8	770.3
Military	254.7	269.7	272.8	299.5	348.2
Capital	191.2	195.6	248.2	292.3	318.6
Pre-financing deficit/surplus	-94.4	12.4	181.0	69.7	661.6
Sources of financing					
External financing					
External loans	197.9	336.7	328.4	130.3	308.3
Repayments	68.2	125.3	119.8	263.5	348.0
Net external financing	129.7	211.4	208.6	-133.2	-39.7
Domestic financing					
Domestic loans	33.6	2.3	0.0	0.0	0.0
Repayments	19.2	9.4	51.2	47.7	15.5
Net domestic financing	14.4	-7.1	-51.2	-47.7	-15.5
Post financing deficit/surplus	49.7	216.7	338.4	-111.2	606.4

Source : Statistical Year Book 1994, Department of Statistics.

(Note) * : Excerpts from Monthly Statistical Bulletin Vol.31 No.12, December 1995, Department of Research and Studies, Central Bank of Jordan.

Appendix 2.7 External Trade Situation Since 1967

(thousand JDs.)

Year	Export	Import	Trade balance
1967	11,327	55,048	-43,721
1968	14,263	57,492	-43,229
1969	14,749	67,752	-53,003
1970	12,170	65,882	-53,712
1971	11,441	76,627	-65,186
1972	17,006	95,310	-78,304
1973	18,985	108,248	-89,263
1974	49,752	156,607	-106,855
1975	48,938	234,013	-185,075
1976	69,445	339,495	-270,050
1977	82,100	454,518	-372,418
1978	90,911	458,943	-368,032
1979	120,907	585,666	-464,759
1980	171,576	715,977	-544,401
1981	242,633	1,047,505	-804,872
1982	264,528	1,142,493	-877,965
1983	210,575	1,103,310	-892,735
1984	290,657	1,071,340	-780,683
1985	310,888	1,074,445	-763,557
1986	256,028	850,199	-594,171
1987	315,709	915,555	-599,846
1988	381,271	1,021,667	-640,396
1989	632,988	1,230,142	-597,154
1990	706,087	1,725,828	-1,019,741
1991	770,744	1,710,463	-939,719
1992	829,303	2,214,002	-1,384,699
1993	864,662	2,453,625	-1,588,963
1994	995,181	2,362,583	-1,367,402

Source : Statistical Year Book 1994, Department of Statistics.

Appendix 2.8 International Balance of Payment in Cash Basis

(Million JDs)

Items	1990		1991		1992		1993		1994	
	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit	Debit
A Current Account	2,457.8	2,606.0	2,415.8	2,684.8	2,749.0	3,269.6	3,022.5	3,347.5	3,147.1	3,323.3
1) Goods and Services	2,043.3	2,600.9	2,075.7	2,681.8	2,463.2	3,262.8	2,744.8	3,341.0	2,900.3	3,304.1
Goods	706.1	1,714.7	770.7	1,764.8	829.3	2,291.0	864.7	2,449.9	995.2	2,357.6
Services	1,337.2	886.2	1,305.0	917.0	1,633.9	971.8	1,880.1	891.1	1,905.1	946.5
Trade Balance		1,008.6		994.1		1,461.7		1,585.2		1,362.4
Services Balance	451.0		388.0		662.1		989.0		958.6	
Trade and Services Balance		557.6		606.1		799.6		596.2		403.8
2) Unrequited Transfers	414.5	5.1	340.1	3.0	285.8	6.8	277.7	6.5	246.8	19.2
Private	24.0	5.1	17.6	3.0	22.9	6.8	30.8	6.5	20.5	19.2
Government	390.5	0.0	322.5	0.0	262.9	0.0	246.9	0.0	226.3	0.0
Net Unrequited transfers	409.4		337.1		279.0		271.2		227.6	
Net Current Account		148.2		269.0		520.6		325.0		176.2
B Capital Account	533.1	179.2	962.4	229.2	844.1	360.4	493.7	387.1	425.4	220.8
1) Government	412.8	179.1	413.2	211.6	305.7	343.7	120.6	360.5	246.1	217.6
Assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Liabilities	412.8	179.1	413.2	211.6	305.7	343.7	120.6	360.3	246.1	217.5
2) Private Long-term Investment	0.0	0.1	0.0	9.5	0.0	5.0	0.0	0.2	0.0	0.0
Assets	0.0	0.1	0.0	9.5	0.0	5.0	0.0	0.2	0.0	0.0
Liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3) Private Short-term Investment	45.8	0.0	0.2	8.1	47.1	11.7	40.5	26.4	21.4	3.2
Assets	20.9	0.0	0.2	0.0	7.3	0.0	37.4	0.2	18.2	2.0
Liabilities	24.9	0.0	0.0	8.1	39.8	11.7	3.1	26.2	3.2	1.2
4) Transfers of Worker's Savings	74.5	0.0	549.0	0.0	491.3	0.0	332.6	0.0	157.9	0.0
Net Capital Account	353.9		733.2		483.7		106.6		204.6	
Overall Balance (A + B)	205.7		464.2		36.9		218.4		28.4	
C Reserves	8.2	276.9	807.5	1,511.6	337.9	371.1	213.9	179.8	240.2	273.9
1) Central Bank	0.0	40.7	0.0	578.3	0.4	52.0	46.5	0.0	0.0	152.2
Assets	0.0	40.7	0.0	578.3	0.0	52.0	46.0	0.0	0.0	146.2
Liabilities	0.0	0.0	0.0	0.0	0.4	0.0	0.5	0.0	0.0	6.0
2) Commercial Banks	0.0	232.6	800.6	961.3	336.1	317.8	163.1	178.6	240.2	121.7
Assets	0.0	187.5	0.0	961.3	0.0	317.8	163.1	0.0	0.0	121.7
Liabilities	0.0	45.1	800.6	0.0	336.1	0.0	0.0	178.6	240.2	0.0
3) Financial Institutions	8.2	3.6	6.9	2.0	1.4	1.3	4.3	1.2	0.0	0.0
Assets	8.2	0.0	6.9	0.0	1.4	0.0	4.3	0.0	0.0	0.0
Liabilities	0.0	3.6	0.0	2.0	0.0	1.3	0.0	1.2	0.0	0.0
Net Reserves		268.7		734.1		33.2		34.1		33.7
Errors and Omissions	63.0		269.9		70.1		184.3		5.3	

Source: Monthly Statistical Bulletin, Vol.31 No.12, December 1995, Department of Research and Studies, Central Bank of Jordan.

Appendix 2.9 Commodities of Exports and Imports in Jordan

(Million JDs)

Commodities	1990	1991	1992	1993	1994	Share rate as of 1991 (%)	Growth rate (%)
Exports	706	768	830	864	994	100.00%	8.93%
Domestic Exports	612	597	634	691	793	79.78%	6.69%
Food and Live Animals	60	86	92	140	91	9.15%	10.97%
Live animals	1	9	15	18	13	1.31%	
Dairy products and eggs	10	7	15	38	3	0.30%	
Wheat and flour of wheat	1	0	0	0	0	0.00%	
Vegetables	37	41	40	48	44	4.43%	
Fruits and nuts	8	11	10	21	21	2.11%	
Fodder	0	5	6	5	2	0.20%	
Beverages and Tobacco	4	7	5	4	4	0.40%	0.00%
Cigarettes	2	4	3	1	11	1.11%	
Crude Materials, Inedible, except fuels	235	228	218	193	208	20.93%	-3.01%
Phosphates	139	123	122	98	100	10.06%	
Potash	89	97	86	86	93	9.36%	
Mineral Fuels, Lubricants and related Materials	0	0	0	0	0	0.00%	
Animal and Vegetable Oils and Fats	1	2	2	2	63	6.34%	181.73%
Olive oils	1	0	0	1	0	0.00%	
Chemicals	189	177	197	195	262	26.36%	8.51%
Paints	6	4	3	5	4	0.40%	
Medicaments	40	35	55	70	91	9.15%	
Detergents and soap	14	13	35	36	27	2.72%	
Fertilizers	79	86	72	56	89	8.95%	
Manufactured Goods Classified by Material	78	63	67	81	86	8.65%	2.47%
Articles of wood	2	0	0	0	0	0.00%	
Paper and cardboard	8	8	6	13	12	1.21%	
Textile yarn, fabrics, made-up articles and related products	19	12	15	19	21	2.11%	
Cement	22	26	22	17	27	2.72%	
Machinery and Transport Equipment	14	7	12	24	39	3.92%	29.19%
Miscellaneous Manufactured Articles	31	27	41	52	40	4.02%	6.58%
Clothes	7	9	9	13	13	1.31%	
Plastic products	4	6	10	15	11	1.11%	
Commodities and Transactions not Classified Elsewhere	0	0	0	0	0	0.00%	
Re-Export	94	171	196	173	201	20.22%	20.93%
Consumer Goods	15	60	62	38	43	4.33%	30.32%
Current consumer goods	8	48	44	26	26	2.62%	
Durable consumer goods	7	12	18	12	17	1.71%	
Crude Materials and Intermediate Goods	12	58	73	57	47	4.73%	40.68%
Construction materials	1	1	1	1	1	0.10%	
Other intermediate goods	11	57	72	56	46	4.63%	
Parts and accessories	23	23	32	43	64	6.44%	29.16%
Capital Goods	20	30	23	35	44	4.43%	21.79%
Other Goods not Classified Elsewhere	24	0	6	0	3	0.30%	-10.54%
Import	1,726	1,712	2,215	2,456	2,364	100.00%	8.18%
Food and Live Animals	404	418	416	435	410	17.34%	0.37%
Live animals	21	37	26	28	31	1.31%	
Meat	35	56	50	58	43	1.82%	
Dairy products and eggs	28	34	35	41	31	1.31%	
Wheat and flour of wheat	74	62	54	76	52	2.20%	
Rice	28	27	21	20	16	0.68%	
Sugar	54	46	29	33	56	2.37%	
Fruits, vegetables and nuts	27	33	42	26	28	1.18%	
Coffee, tea, cocoa and spices	13	14	14	11	15	0.63%	
Beverages and Tobacco	10	10	9	10	14	0.59%	8.78%
Crude tobacco	5	5	4	2	5	0.21%	
Cigarettes	2	3	3	5	7	0.30%	
Crude Materials, Inedible, Except Fuels	43	59	46	56	72	3.05%	13.75%
Wood, lumber and cork	0	1	2	2	17	0.72%	
Textile, fabrics and their waste	10	11	11	14	14	0.59%	
Oil seeds, oil nuts and oil kernels	10	8	7	7	6	0.25%	
Mineral Fuels, Lubricants and Related Materials	312	247	303	315	301	12.73%	-0.89%
Crude oil	236	194	229	237	32	1.35%	
Animal and Vegetable Oil and Fats	22	24	38	43	83	3.51%	39.37%
Chemicals	190	219	246	249	280	11.84%	10.18%
Medical and pharmacy products	37	39	57	67	67	2.83%	
Essential oils and perfume materials, polishing and cleaning preps	10	10	17	20	15	0.63%	
Fertilizers	5	7	12	8	7	0.30%	
Plastic materials	52	50	61	62	56	2.37%	
Manufactured Goods Classified by Materials	300	328	445	507	432	18.27%	9.54%
Rubber products	21	24	31	31	31	1.31%	
Paper and cardboard	38	43	49	55	47	1.99%	
Textile yarn, fabrics, made-up articles and related products	71	77	94	95	88	3.72%	
Cement	0	0	0	1	0	0.00%	
Iron and steel	70	85	134	158	131	5.54%	
Machinery and Transport Equipment	327	299	544	661	600	25.38%	16.39%
Electrical and non-electrical machinery	151	149	274	375	361	15.27%	
Transport equipments and spareparts	177	150	270	285	239	10.11%	
Miscellaneous Manufactured Articles	92	91	151	151	152	6.43%	13.37%
Furniture	6	2	3	4	6	0.25%	
Clothing and footwear	21	25	42	42	36	1.52%	
Scientific instruments, photographic equipments etc.	19	21	40	38	41	1.73%	
Commodities and Transactions not Classified Elsewhere	26	14	17	29	20	0.85%	-6.35%

Source: Monthly Statistical Bulletin, Vol 31 No.12, Central Bank of Jordan, December 1995.

Appendix 2.10 Industrial Production of Principal Industries in Jordan

Industrial Sector	Unit	1991	1992	1993	1994	1995	Growth rate (%)
Mining and Quarrying							
Phosphate	1,000 tons	4,461	4,296	4,222	418	4,984	2.81%
Potash	1,000 tons	1,364	1,346	1,370	1,550	1,780	6.88%
Manufacturing							
Fodder	1,000 tons	47	54	44	50	54	3.53%
Alcoholic Drinks	1,000 liter	6,280	6,285	6,572	6,454	6,847	2.18%
Cigarettes	Million pcs.	3,719	3,091	3,465	4,115	3,667	-0.35%
Clothing and Textiles							
Textiles	1,000 yards	1,084	1,101	1,142	1,052	1,745	12.64%
Spinning	tons	2,294	1,472	1,684	1,826	1,524	-9.72%
Leather							
Upper leather	1,000 ft ²	2,264	2,640	2,587	2,196	2,520	2.71%
Sole leather and wool	tons	34	49	59	50	51	10.67%
Chemicals							
Fertilizers	1,000 tons	602	554	470	750	729	4.90%
Chemical acids	1,000 tons	1,300	1,110	849	1,382	1,338	0.72%
Detergents	1,000 tons	40	34	32	24	22	-13.88%
Construction Materials							
Cement	1,000 tons	2,752	2,746	3,079	3,076	3,152	3.45%
Iron	1,000 tons	200	235	181	157	151	-6.78%
Metalic pipes	1,000 tons	9	15	17	10	9	0.00%
Petroleum Products	1,000 tons	2,307	2,840	2,815	2,918	3,101	7.67%
Paper and Cardboard	1,000 tons	21	17	16	18	14	-9.64%
Liquid Batteries	1,000 pcs.	85	87	77	72	70	-4.74%
Electricity	Million KWh	3,395	4,063	4,435	4,728	5,252	11.52%

Source : Monthly Statistical Bulletin. Vol.31 No.12, Central Bank of Jordan, December 1995.

Appendix 2.11 Principal Agricultural Production in Jordan

Kind of production	(1,000 tons)										1994 Growth rate (%)	
	1988	1989	1990	1991	1992	1993	1994	1994	1994	1994		
I. Plant Production												
A. Field crops												
Wheat	78.8	54.5	82.9	61.8	75.4	57.1	46.9	46.9	46.9	46.9	46.9	-12.17%
Barley	44.9	20.6	42.4	39.9	68.9	31.8	27.4	27.4	27.4	27.4	27.4	-11.62%
Tobacco	3.7	2.9	2.9	1.3	3.2	3.4	1.5	1.5	1.5	1.5	1.5	-20.21%
Lentils	6.5	1.6	4.1	1.2	2.8	4.8	1.4	1.4	1.4	1.4	1.4	-31.88%
B. Vegetables												
Tomatoes	218.7	250.4	376.9	275.5	490.3	531.5	438.7	438.7	438.7	438.7	438.7	19.01%
Eggplant	72.9	43.8	59.5	61.1	49.4	33.6	37.9	37.9	37.9	37.9	37.9	-15.09%
Cucumbers	68.0	53.1	54.3	56.2	34.2	46.0	35.1	35.1	35.1	35.1	35.1	-15.24%
Cauliflower and cabbages	33.6	23.7	44.3	40.9	30.7	27.6	51.8	51.8	51.8	51.8	51.8	11.43%
Melons	87.0	66.7	80.5	94.3	90.3	64.3	145.2	145.2	145.2	145.2	145.2	13.66%
C. Fruit trees												
Olives	70.8	25.7	63.7	40.6	81.8	31.8	94.1	94.1	94.1	94.1	94.1	7.37%
Grapes	21.5	21.8	45.7	39.1	50.2	35.2	26.4	26.4	26.4	26.4	26.4	5.27%
Citrus fruits	101.3	166.7	154.1	151.9	160.3	106.8	150.7	150.7	150.7	150.7	150.7	10.44%
Bananas	33.3	13.4	18.9	26.3	11.5	30.3	24.7	24.7	24.7	24.7	24.7	-7.20%
2. Livestock Production												
Red meat	8.3	9.4	10.1	16.8	16.8	18.9	16.1	16.1	16.1	16.1	16.1	18.01%
Poultry meat	68.0	43.0	50.0	60.0	70.0	83.4	94.0	94.0	94.0	94.0	94.0	8.43%
Milk	66.4	69.4	96.4	156.7	156.7	166.6	151.4	151.4	151.4	151.4	151.4	22.88%
Eggs (mill. egg)	380.0	350.0	530.0	710.0	775.0	862.2	871.0	871.0	871.0	871.0	871.0	25.04%

Source : Monthly Statistical Bulletin, Vol.31 No.12, Central Bank of Jordan, December 1995.

Appendix 2.12 Situation of Economic Activities by Industrial Origin

As of 1995

Industrial origin	Number of employees		Number of enterprises (Firms)	Gross value added (Domestic production) (1,000 JDs)	Inter-mediate consumption (1,000 JDs)	Gross output (1,000 JDs)	Net indirect taxes	Depreciation (1,000 JDs)	Operating surplus (1,000 JDs)	Comparison of employees (1,000 JDs)
	Female (Persons)	Male (Persons)								
	Total (Persons)	Total (Persons)								
Mining and quarrying	174	8,232	125	132,617	107,903	240,525	25,750	28,692	34,256	43,918
Food manufacturing	648	12,418	13,066	51,449	167,037	218,486	1,998	8,209	23,362	17,881
Beverage industries	113	1,200	23	34,454	18,129	52,583	18,276	1,222	11,435	3,520
Tobacco manufacturing	37	971	4	69,741	14,374	84,115	63,127	152	2,309	4,154
Manufacture of textiles	598	1,813	214	11,926	26,720	38,646	2,190	2,131	3,376	4,228
Manufacture of wearing apparel (except footwear)	1,210	3,981	1,536	10,484	14,061	24,545	128	604	5,682	4,070
Manufacture of leather and leather products	27	326	68	2,576	7,251	9,827	15	220	1,289	1,052
Manufacture of footwear, except vulcanized or moulded rubber or plastic footwear	97	1,236	1,333	4,952	6,809	11,761	30	509	2,646	1,766
Furniture and wood products	59	8,489	8,548	24,930	30,359	55,289	345	2,073	14,495	8,016
Paper and paper products	307	2,022	2,329	14,391	41,891	56,282	2,449	2,449	3,627	5,865
Printing publishing and allied industries	115	2,945	3,060	20,309	34,425	54,734	121	2,311	10,340	7,537
Chemical and chemical products	1,474	5,796	115	64,050	337,117	401,167	4,494	11,095	23,301	25,159
Petroleum refineries	71	3,773	3,844	34,297	340,049	374,346	4,901	4,391	5,484	19,520
Manufacture of rubber products	0	125	10	520	532	1,072	7	104	197	212
Manufacture of plastic products (N.I.E.C)	135	3,457	3,592	16,021	26,379	42,400	268	2,628	6,498	667
Manufacture of non-metallic mineral products	100	11,930	12,030	111,454	106,672	218,126	29,823	17,210	42,155	22,265
Basic metal products	16	1,361	1,377	28,619	64,118	92,737	10,425	2,063	11,649	4,482
Manufacture of fabricated metal products except machinery and equipment	87	7,852	7,939	23,645	45,002	68,647	743	2,754	12,609	7,539
Machinery other than electrical	45	1,649	1,694	8,567	19,532	28,149	853	770	4,256	2,689
Manufacture of electrical machinery apparatus, appliances and supplies	62	707	769	5,457	12,988	18,445	1,074	638	2,243	1,502
Manufacture of transport equipment	34	762	796	6,689	18,176	24,865	223	333	4,710	1,423
Manufacture of professional scientific, measuring and controlling equipment not (N.I.E.C)	51	94	145	896	789	1,685	19	233	249	394
Other manufacturing industries	10	147	157	268	126	394	22	119	-2	129
Electricity	276	4,739	5,015	64,826	70,283	135,109	357	20,659	22,810	21,000
Industrial services	1	16,574	16,575	23,679	12,678	36,357	555	1,042	12,869	9,213
Total	5,747	102,599	108,346	766,817	1,523,475	2,290,292	168,193	112,611	261,845	218,201

Source: Statistical Year Book 1994, Department of Statistics, No.45, October 1995.

Appendix 2.13 Infrastructure in Jordan

(A) Length of Road as of 1994 (km)

Governorat	Highway	Secondary road	Village road	Total
Amman	314	238	447	999
Zarqa	278	109	175	562
Balqa	153	168	286	607
Irbid	381	489	421	1,291
Ma'an	705	292	217	1,214
Karak	334	214	257	805
Mafrak	484	285	247	1,016
Tafielah	167	104	80	351
Madaba	0	0	0	0
Jarash	0	0	0	0
Ajilun	0	0	7	7
Aqaba	4	0	0	4
Total	2,820	1,899	2,137	6,856

Source : Statistical Year Book 1994, Dep. of Statistics.

(B) Shipping Activity in Aqaba Port

Year	Loaded goods (tons)	Unloaded goods (tons)	Total handled goods (tons)	Number of vessels (ships)
1979	2,708,731	2,301,369	5,010,100	1,238
1980	3,574,456	3,024,135	6,598,591	1,466
1981	3,530,062	5,804,686	9,334,748	1,744
1982	3,835,459	7,837,244	11,672,703	2,599
1983	5,059,108	6,098,765	11,157,873	2,454
1984	7,158,108	6,448,343	13,606,451	2,329
1985	8,177,607	6,370,104	14,547,711	2,671
1986	9,697,388	7,153,240	16,850,628	2,677
1987	11,271,622	8,743,749	20,015,371	2,555
1988	10,952,973	9,143,165	20,096,138	2,583
1989	9,985,974	8,694,675	18,680,649	2,446
1990	8,871,857	61,465,999	70,337,856	2,222
1991	7,677,470	5,547,998	13,225,468	2,075
1992	7,361,798	6,021,703	13,383,501	2,433
1993	6,381,221	5,252,689	11,633,910	2,490
1994	6,648,377	3,923,903	10,572,280	2,486

Source : Statistical Year Book 1994, Dep. of Statistics.

Appendix 2.14 Average Annual Current Income per Household by Economic Activity and Source of Income

(A) Basic Conditions of Household Expenditure and Income Survey

Economic activities of household head	Number of samples		Persons per HHs	HHs size (persons)/ HH	Persons by economic activities (above 13 year) (persons) Share(%)
	Samples (HHs)	Share rate (%)			
Agriculture	403	7.30%	3,291	8.17	536 5.11%
Mining	93	1.69%	683	7.34	116 1.11%
Industry	577	10.46%	3,898	6.76	1,192 11.37%
Electricity, gas and water	92	1.67%	685	7.45	112 1.07%
Construction	464	8.41%	3,236	6.97	797 7.60%
Trade, restaurant and hotels	972	17.62%	6,843	7.04	1,594 15.21%
Transportation	656	11.89%	4,956	7.55	902 8.60%
Finance and banking	106	1.92%	653	6.16	174 1.66%
Services	2,154	39.04%	13,813	6.41	5,060 48.27%
Total	5,517	100.00%	38,058	6.90	10,483 100.00%

(B) Income Level by Economic Activity and Source of Income

Economic activities of household head	Gross income		Income from employment					Total income			Other current receipts	Grand total of current income (JD/year/HH)	
	In cash	Net income	In kind					from employ-ment	Own account workers	Property income			
			Food	Housing	Clothes	Others	Total						
Agriculture	1,286	1,214	6	5	10	5	25	1,310	2,522	1,693	277	2	5,805
Mining	3,609	3,266	24	47	2	28	101	3,710	352	537	601	0	5,200
Industry	2,247	2,125	8	20	3	9	39	2,286	3,318	903	346	31	6,884
Electricity, gas and water	2,683	2,451	6	0	3	25	34	2,717	140	601	275	2	3,735
Construction	1,838	1,793	2	1	2	0	5	1,843	1,676	811	345	3	4,678
Trade, restaurant and hotels	1,381	1,324	9	1	3	3	15	1,396	3,011	1,175	557	7	6,147
Transportation	1,733	1,643	7	1	5	3	15	1,749	1,410	620	332	10	4,121
Finance and banking	4,139	3,665	0	36	9	2	48	4,187	120	796	1,209	33	6,344
Services	2,470	2,268	3	8	12	9	32	2,502	352	773	365	18	4,011
Not applicable	1,179	1,112	4	1	6	2	13	1,192	386	1,058	1,126	7	3,769
Weighted average in Jordan	1,828	1,708	5	6	7	5	23	1,851	1,193	946	606	12	4,607

Source : Household Expenditure and Income Survey 1992, Department of Statistics.

Appendix 2.15 Average Annual Expenditure by Governorate and Expenditure Item

(JD/year/III)

Expenditure item	Whole Jordan			Governorate							
	Rural	Urban	Jordan	Amman	Irbid	Zarqa	Balka	Mafraq	Karak	Ma'an	Tafila
Current income	3,532	4,898	4,607	5,795	3,966	4,003	4,203	2,997	2,648	4,355	2,899
Food, beverages and tobacco	1,832	1,862	1,856	2,053	1,947	1,590	1,458	1,511	1,544	1,835	1,459
Cereals and products	189	146	155	156	164	130	163	171	190	166	121
Meats and poultry	485	514	507	573	501	443	441	382	434	461	462
Fish and sea products	28	32	31	35	30	24	21	23	29	59	27
Dairy products and eggs	203	210	209	240	217	156	150	120	204	280	178
Oils and fats	184	162	166	161	246	121	109	79	99	159	127
Fruits	92	116	111	127	118	99	74	70	69	102	79
Vegetables	183	172	174	177	192	169	126	186	121	152	165
Dry and canned legumes	26	19	20	18	28	16	15	15	24	30	16
Spices	17	11	12	12	14	7	14	17	11	16	8
Nuts	10	18	16	24	12	10	9	5	8	16	5
Sugar and confectioneries	129	104	109	120	106	88	92	144	120	109	90
Tea, coffee and cacao	70	46	51	51	61	30	63	74	69	52	35
Other food items	80	116	108	126	104	119	45	64	60	113	53
Beverages	25	37	34	43	30	32	24	22	22	29	21
Alcohol	2	3	3	5	2	0	4	2	6	0	0
Tobacco and cigarettes	112	158	148	185	122	146	110	138	81	92	74
Other commodities/services	1,884	2,935	2,064	3,520	2,249	2,617	1,654	1,540	1,378	2,106	1,865
Ready made men's cloths	77	95	92	107	94	83	65	52	49	83	78
Ready made women's cloths	93	109	106	124	102	100	63	91	55	105	95
Children's cloths	85	86	86	93	82	93	60	84	48	83	87
Clothing and tailoring expense	18	21	20	21	22	24	8	19	10	22	12
Footwear	61	71	69	77	68	70	49	50	37	61	60
Housing and related expenses	444	795	72	978	529	673	540	391	427	524	372
Fuels, electricity and water	177	243	229	297	190	200	164	183	155	164	136
House furnishings	100	137	129	134	136	158	57	92	58	92	153
Household appliances	53	61	60	59	70	65	25	42	24	68	71
Utensils	15	18	18	15	21	24	7	12	6	18	16
Cleaning materials	65	72	71	81	77	61	42	35	52	66	67
Transportation	337	556	510	743	339	466	284	199	226	385	333
Education	69	184	160	226	134	143	79	49	62	78	71
Medical care	50	116	102	148	58	118	50	50	31	64	43
Personal care	124	163	155	161	177	166	80	116	71	126	138
Recreation	50	105	93	121	83	94	37	41	30	85	61
Other expenses (N.E.C)	68	101	94	134	70	81	46	35	39	86	71
Total	3,716	4,797	3,920	5,573	4,196	4,207	3,112	3,051	2,922	3,941	3,324

Source: Household Expenditure and Income Survey 1992, Department of Statistics.

Appendix 2.16 Cost of Living Index and Exchange Rate

(A) Cost of Living Index

Year	Living index				
	General	Food	Clothing & footwear	Housing	Other goods and services
1991	96.2	97.1	92.1	96.2	96.7
1992	100.0	100.0	100.0	100.0	100.0
1993	103.3	101.9	105.8	106.3	101.5
1994	107.0	107.9	109.9	108.6	102.6
1995	109.5	110.4	117.9	111.4	102.9
Annual average growth ratio(%)	3.29%	3.26%	6.37%	3.74%	1.57%
1995					
June	107.8	107.0	116.9	111.4	102.0
July	107.6	106.5	116.9	111.4	102.0
Aug.	108.9	108.9	117.1	111.4	103.2
Sep.	109.4	109.4	118.2	111.9	103.8
Oct.	111.8	112.2	125.2	113.6	104.6
Nov.	113.3	114.9	128.8	114.0	104.7
Dec.	114.3	114.7	129.5	116.0	106.5
1996					
Jan.	116.2	117.0	134.8	116.5	108.4
Feb.	118.0	120.4	136.7	116.7	109.2
Mar.	118.1	120.3	137.6	116.9	109.2
Apr.	117.2	117.7	130.0	116.9	109.0
May	115.3	115.0	128.9	117.3	109.1
June	113.3	110.8	127.6	116.7	109.0
Average monthly growth ratio(%) since June 1995	0.42%	0.29%	0.73%	0.39%	0.55%
Equivalent %/annum since 1991	3.33%	2.67%	6.74%	3.94%	2.42%

(B) Exchange Rate

	US Dollar			Japanese Yen (¥100)		
	Selling	Buying	Average	Selling	Buying	Average
1991	682.2	679.5	680.9	507.7	505.1	506.4
1992	680.8	678.8	679.8	538.7	536.0	537.4
1993	693.9	691.9	692.9	626.5	623.4	625.0
1994	699.8	697.8	698.8	686.2	682.7	684.5
1995	701.8	699.8	700.8	750.9	747.2	749.1
Annual average decreasing ratio(%)	0.71%	0.74%	0.72%	10.28%	10.28%	10.28%
1995						
June	694.9	692.9	693.9	823.5	819.4	821.5
July	697.5	695.5	696.5	801.4	797.4	799.4
Aug.	709.8	707.8	708.8	749.9	746.1	748.0
Sep.	714.6	712.6	713.6	711.7	708.2	710.0
Oct.	712.4	710.4	711.4	708.3	704.8	706.6
Nov.	710.0	708.0	709.0	696.9	693.5	695.2
Dec.	710.0	708.0	709.0	697.6	694.1	695.9
1996						
Jan.	710.0	708.0	709.0	673.1	669.8	671.5
Feb.	710.0	708.0	709.0	671.9	668.6	670.3
Mar.	710.0	708.0	709.0	670.7	667.4	669.1
Apr.	710.0	708.0	709.0	660.0	656.7	658.4
May	710.0	708.0	709.0	668.6	665.2	666.9
June	710.0	708.0	709.0	652.6	649.4	651.0
Average monthly decreasing ratio(%) since June 1995	0.18%	0.18%	0.18%	-1.92%	-1.92%	-1.92%
Equivalent %/annum	0.80%	0.83%	0.81%	5.15%	5.15%	5.15%

Source: Monthly Statistical Bulletin Vol.32 No.6, Central Bank of Jordan, June 1996.

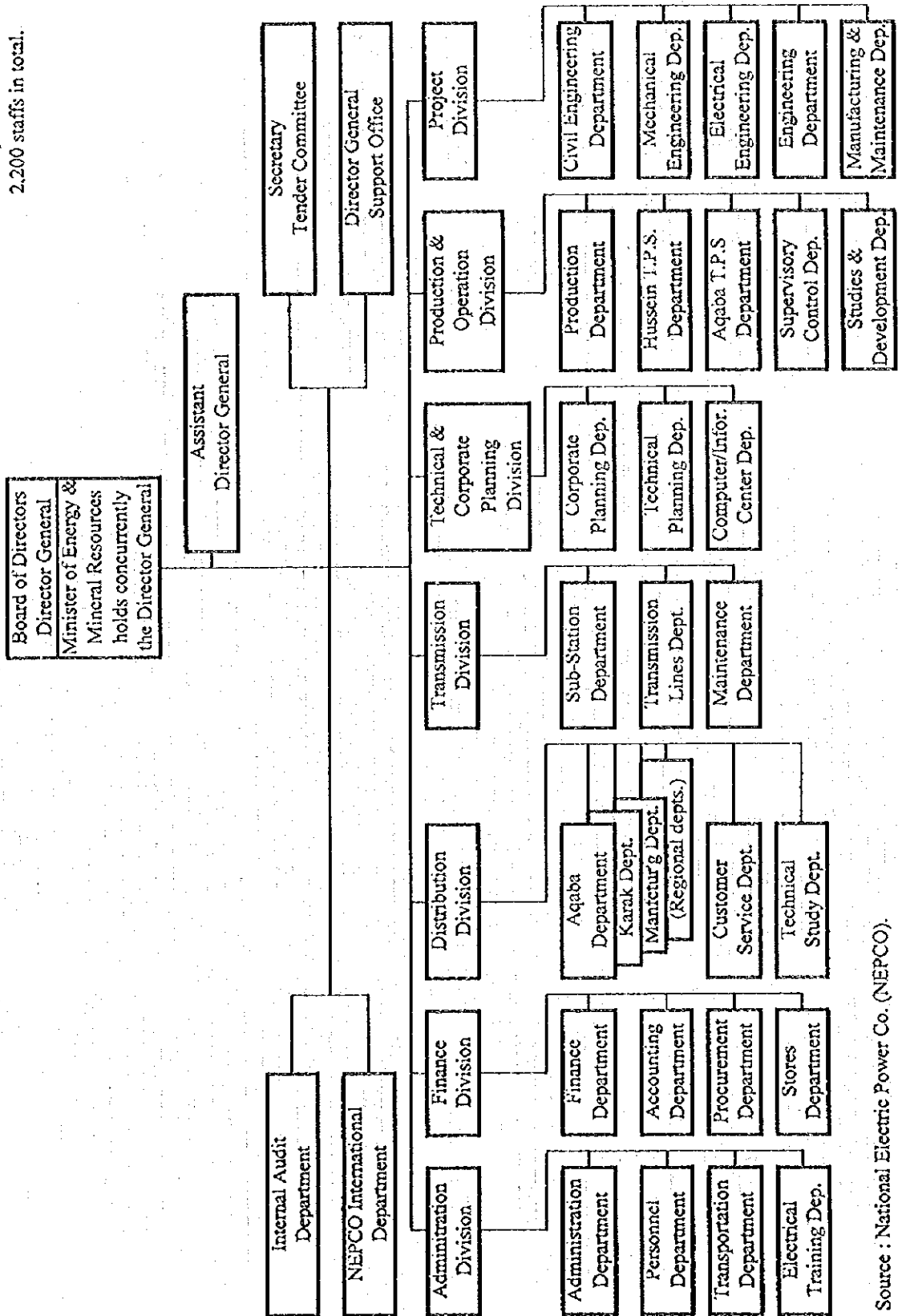
CHAPTER 3

ELECTRICITY IN JORDAN



Appendix 3.1 Organization of National Electric Power Company (NEPCO)

As of September 1996,
2,200 staffs in total.



Source : National Electric Power Co. (NEPCO).

Appendix 3.2 Situation of Electrification in Jordan

(A) Electrical Energy Production in Jordan (Interconnected System)

Name of power station							(GWh)
	1990	1991	1992	1993	1994	1995	Annual growth rate(%)
National Electric Power Co (NEPCO)	3,258	3,342	4,018	4,389	4,676	5,201	9.80%
Hussein Thermal	1,288	1,483	1,760	2,040	2,377	2,181	11.14%
Aqaba Thermal	1,463	1,352	1,611	1,594	1,235	1,886	5.21%
Risha	433	419	456	539	773	751	11.64%
Marka	32	38	90	108	128	97	25.28%
Karak	0	1	3	5	18	7	226.32%
Remote Village	0	0	0	0	1	0	-
Aqaba Central	29	34	39	45	61	54	12.80%
Amman South Gas Turbine	1	7	12	30	64	99	171.37%
Rehab	0	0	0	0	3	105	-
King Total Dam & Fertilizer Co.	11	7	16	27	17	17	8.70%
Wind Energy	1	1	1	1	1	1	-3.85%
IDECO	11	9	6	9	11	12	1.76%
Potash Co.	95	94	105	117	110	113	3.53%
Cement Factories Co.	16	40	39	36	40	39	19.51%
Total	3,380	3,485	4,168	4,551	4,837	5,365	

(B) Electrical Energy Sales by NEPCO

Energy consumption in Jordan and NEPCO sell to :							(GWh)
	1990	1991	1992	1993	1994	1995	Annual growth rate(%)
Electrical energy consumption in whole Jordan	3,089	3,141	3,674	3,981	4,330	4,778	9.12%
I. Bulk sales	2,641	2,713	3,291	3,606	3,865	4,269	10.08%
JEPSCO	1,572	1,664	1,920	2,152	2,397	2,606	10.64%
IDECO	391	419	472	521	585	654	10.83%
Refinery Co.	12	15	19	27	30	24	15.25%
Cement Factories Co.	147	147	161	187	180	187	4.98%
South Cement Co.	118	105	147	176	174	175	8.20%
Potash Co.	120	118	111	105	149	176	7.84%
El-Hasa Phosphate Co.	99	89	96	92	51	87	-2.62%
Shcidiyah Phosphate Co.	2	5	14	18	20	21	61.85%
Fertilizer Co.	3	0	1	8	19	10	23.33%
Queens Alia Interl Airport	40	35	38	40	40	41	0.45%
Water Authority	122	105	235	225	208	277	17.86%
Haranch	15	11	10	9	15	12	-4.08%
Export to Syria	0	0	67	46	0	0	-
II. Retail sales	269	278	313	345	361	397	8.11%
Aqaba area	93	93	106	119	123	133	7.48%
Ma'an and Shoubak areas	33	34	37	41	45	49	7.99%
Karak area	72	76	85	87	91	99	6.50%
Tafila area	10	10	11	14	15	16	11.30%
Jordan Valley area	53	55	61	71	74	83	9.45%
Eastern area	8	10	11	12	14	16	16.07%
Amman	1	1	1	1	1	1	8.45%
Total	2,909	2,991	3,604	3,951	4,227	4,665	9.91%

(C) Number of Consumers in Jordan

Energy consumption in Jordan and NEPCO sell to :							(thousand)
	1990	1991	1992	1993	1994	1995	Annual growth rate(%)
NEPCO	69	74	77	81	85	90	5.46%
Jordan Valley areas	17	18	18	20	20	21	4.39%
Karak and Tafila areas	31	32	34	35	38	40	5.11%
Ma'an and Shoubak areas	10	11	11	12	12	13	5.06%
Aqaba area	11	11	12	13	13	14	5.20%
Eastern area	0	2	2	2	2	2	-
JEPSCO	329	342	360	381	406	430	5.52%
IDECO	122	126	131	139	146	154	4.83%
Others	0	0	0	0	0	0	-12.94%
Total	520	542	568	601	637	674	5.34%

(D) Number of Consumers by Type of Consumption in 1995

Energy consumption in Jordan and NEPCO sell to :	Domestic	Industrial	Commercial	W.pumping	Governmental	Others	Total
NEPCO	75,381	895	9,867	723	2,642	967	90,475
Jordan Valley area	18,001	103	1,783	486	600	241	21,214
Karak area	25,548	287	2,606	87	648	337	29,513
Tafila area	8,747	63	1,040	26	394	133	10,403
Ma'an and Shoubak areas	10,378	262	1,383	94	541	174	12,832
Aqaba area	11,215	165	2,497	19	349	72	14,317
Eastern area	1,492	15	558	11	110	10	2,196
JEPSCO's supply area	348,078	7,179	67,282	487	2,124	4,883	430,033
IDECO's supply area	129,816	2,487	17,034	761	1,376	2,279	153,753
Others	212	0	8	0	0	3	223
Total	553,487	10,561	94,191	1,971	6,142	8,132	674,484

Source: Annual Report 1995, Jordan Electricity Authority (JEA) (now named as NEPCO).

Appendix 3.3 Statement of Income and Expenses of Electricity Enterprises

Debit	NEPCO		JEPKO	IDECO
	In 1994	in 1995	in 1994	in 1994
Revenue from:				
Electricity sales	121,489,052	134,541,212	86,821,457	21,252,652
Production poles	119,242,838	132,012,477	84,567,035	16,887,571
Other operating revenue	1,404,900	1,477,673	0	0
Government compensation due to equal tariff difference	841,314	1,051,062	2,254,422	967,081
Operating Expenses	97,340,945	108,298,422	77,662,393	3,398,000
Power purchase	0	0	62,045,644	15,149,683
Operating costs - stations	70,366,464	77,763,510	3,879,554	3,386,830
Depreciation of fixed assets	16,143,723	18,148,413	4,314,007	1,182,747
Production cost - Pole plant	1,042,108	1,195,471	0	0
Maintenance expenses	5,038,428	6,013,949	0	0
Expenses related to consumers and collection	261,281	309,109	0	0
Consumers' services	138,703	155,265	0	0
General and administrative expenses	4,350,238	4,714,705	6,592,994	1)
Currency rate differences depreciation	0	0	824,672	0
Fees and taxes	0	0	5,522	0
Reserve for doubtful loans	0	0	0	20,000
Balance	0	0	0	0
Operating profit	24,148,107	26,242,790	9,159,064	1,513,392
Investment incomes	0	0	350,260	2)
Interest on loan and bank charges	-11,961,666	-11,220,934	-3,787,896	-987,078
Currency expenses losses	-5,050,078	-6,710,375	-1,364,507	0
Interest income	253,413	350,403	0	0
Other income and expenses - Net	1,270,288	3,985,803	0	0
Allowance for doubtful debts	-114,005	0	0	0
Contributions	0	0	-13,445	0
Differences in installations of loans	0	0	1,615,287	3)
Profit from operations	8,546,059	12,647,687	5,958,763	526,314
Prior year's net income (expenses)	5,426,832	23,595	0	0
Postponed profits	0	0	0	76,250
Transfer from the optional reserve to close up the postponed loss of previous years	0	0	0	161,100
Net profit (loss) for the year	13,972,891	12,671,282	5,958,763	763,664
Amount transferred to statutory reserve	-1,397,289	-1,267,129	0	0
Accumulated losses - beginning of the year	-28,920,718	-16,345,116	0	0
Accumulated losses - end of the year	-16,345,116	-4,940,963	0	0
Profit Distribution				
Optional or obligatory reserve	0	0	595,876	52,631
Provision for Jordanian University fees	0	0	59,588	5,263
Provision for scientific research and professional training support	0	0	59,588	5,263
Salary for the Board of Directors	0	0	53,636	46,315
Closing up board of directors salaries for 1993	0	0	0	19,083
Income tax for previous year	0	0	114,660	0
Provision for income tax of the year	0	0	2,222,510	0
Profits suggested to be distributed	0	0	1,620,000	0
Profits to close up losses of previous years	0	0	0	0
Clos up part of the debts from the obligatory reserve	0	0	0	655,109
Total	0	0	1,232,905	0
			5,958,763	763,664

Source: Annual Report 1995 (JEA) (now named as NEPCO), The 57th Annual Report (JEPKO), and The 33rd Annual Report (IDECO).

Note 1 Includes the cost for consumers' services.

2 Includes the other incomes.

3 Russian Loan.

4 Includes administration expenses.

5 Includes currency exchange losses.

Appendix 3.4 Balance Sheet of Electricity Enterprises

(JDs)

	NEPCO		JEPKO		IDECO	
	In 1994	In 1995	In 1994	In 1995	In 1994	In 1995
Credit:						
Current Assets	81,932,582	95,991,006	59,082,061	12,450,935		
Cash on hand and at bank	4,722,910	5,812,592	2,262,370	1,769,916		
Accounts receivable	46,107,857	53,504,187	24,106,821	7,305,150		
Debtor obligation and other debtor balance				3,138,369		
Storehouses by cost				237,500		
Investment in electrical industries	27,923,325	33,844,827	11,905,858			
Soareparts, fuel and materials	507,361	602,018				
Interest receivable on Loans	564,516	503,090				
Loan instalments due	693,190	551,673				
Current portion of long-term loans receivable	1,030,952	811,363	737,742			
Deposits on documentary credits	382,471	361,256	69,270			
Prepaid expenses and other debit balances	5,801,487	5,296,728	805,679	207,553		
Investments in companies shares	4,021,250	4,083,750	805,679			
Long-term loans receivable	1,778,526	1,212,978				
Consultancy Projects in progress	1,711	0				
Fixed Assets	285,570,186	319,892,463	94,916,008	31,157,105		
Fixed assets under capital lease	10,885,000	10,885,000				
Fixed assets	391,213,499	428,309,021	103,897,958	32,480,146		
Less: Accumulated depreciation	161,969,386	179,785,855	45,294,305	14,067,002		
Net book value of fixed assets	240,129,115	259,408,166	58,603,653	18,413,144		
Assets contributed by consumers	29,761,236	31,562,970	23,267,639	11,271,477		
Less: Accumulated depreciation	8,239,038	9,507,253	4,607,537	2,164,951		
Net book value of assets contributed by consumers	21,522,198	22,055,717	18,660,102	9,106,526		
Rural fils fund assets	522,916	522,916	1,521,041	2,920,055		
Less: Accumulated depreciation	209,166	220,083	300,345	319,599		
Net book value of rural fils fund assets	313,750	292,833	1,220,696	2,600,456		
Total net book value of total fixed assets	261,965,061	281,756,736	78,484,451	30,120,126		
Assets of loans evaluation differences			20,616,790			
Less: Accumulated depreciation			4,948,030			
Net register value of assets for loans evaluation differences			15,668,760			
Projects under construction and payments to contractors	23,605,125	38,135,727	762,797	1,036,979		
Debit:						
Current Liabilities	71,472,257	98,396,094	54,792,383	14,649,965		
Due to banks	11,399,222	12,020,448	2,924,463			
Notes payable	351,717	148,215	13,450,314			
Accounts payable	21,853,025	42,754,654	26,892,715	3,063,813		
Other creditor balance			3,835,396	2,690,952		
Creditor banks			70,071	1,527,398		
Profits to be distributed			248,921	58,033		
Profits suggested to be distributed to shareholders			1,620,000			
Saving, insurance, medical service accounts			926,523			
Interest payable on loans	3,044,302	2,997,503				
Loan instalments payable	1,031	1,154				
Current portion of long(short)-term loans and bonds	24,834,947	27,064,832	4,823,980	1,868,218		
Contractors' retentions payable	7,441,061	10,678,715				
Advances received on uncompleted projects	2,546,952	2,730,573				
Long-Term Liabilities and Consumers Deposits	186,361,368	192,866,348				
Loans and bonds	202,982,604	209,319,390				
Country-side fils deposits						
Loans to finance fixed assets under capital lease	7,044,620	9,554,803				
Less: Current portion of loans and bonds	24,834,947	27,064,832				
Long-term loans and bonds	185,192,277	191,609,361				
Consumers' deposits	1,169,091	1,276,987				
Equity	115,470,620	129,897,755	80,011,365	4,156,160		
Capital	80,734,011	81,720,120	15,000,000	3,000,000		
Share issuing increase			5,469,154	1,150,061		
Statutory reserve/obligatory reserve	4,834,703	6,101,832	188,243	6,099		
Optional reserve						
Subscribers participations opposite to fixed assets			23,267,639			
Close up of subscribers participations			4,607,537			
Net subscribers participations			18,660,102			
Reserve for expansion programs	17,189,570	17,309,518				
Rural fils fund	7,221,514	7,358,678				
Accumulated losses	-16,345,116	-4,940,963				
Net equity of the Government of Jordan	93,634,682	107,549,185				
Consumers' contributions - Net amortization			26,053,596			
Long-term loans	21,522,198	22,055,717				
Loans evaluation differences			8,426,012			
Provision for retirement compensation			1,993,762			
Rural fils fund - Net amortization	313,750	292,833				
Total of Liability and Equity	373,304,255	421,180,197	134,803,748	43,815,593		

Sources: Annual Report 1995 (JEA (now named as NEPCO), The 57th Annual Report (JEPKO), and The 33rd Annual Report (IDECO).
 Note 1. Subscribers insurance.
 2. Creditor obligations.
 3. Including loan instalments.

Appendix 3.5-1 Calculation of Power Flow and Angle (1/5)
(Branch Data)

* BRANCH DATA (POSITIVE-SEQUENCE) *

CODE	FROM	TO	R	X	Y/2	C C T		ID.	T A P		PHASE MODIFI	
						OLD	NEW CAPACITY		REAL	IMAG. F/T	C	R
1	1	5	0.5200	2.8150	1.4100	0	0	0.0	0.0000	0.0000		
2	5	7	0.5700	3.0950	1.5400	0	0	0.0	0.0000	0.0000		
3	1	9	0.4300	2.3500	1.1700	0	0	0.0	0.0000	0.0000		
6	1	13	1.6000	8.7700	1.0800	0	0	0.0	0.0000	0.0000		
8	9	15	0.3150	1.7200	0.8600	0	0	0.0	0.0000	0.0000		
9	15	17	0.2500	0.8350	0.3700	0	0	0.0	0.0000	0.0000		
10	15	21	0.2450	1.3600	0.6500	0	0	0.0	0.0000	0.0000		
11	13	21	0.4700	2.6000	0.3150	0	0	0.0	0.0000	0.0000		
13	11	21	0.6100	3.3900	0.4100	0	0	0.0	0.0000	0.0000		
15	21	23	0.7700	4.2800	2.0500	0	0	0.0	0.0000	0.0000		
16	21	25	0.4100	2.3150	1.0500	0	0	0.0	0.0000	0.0000		
17	25	27	1.1850	6.6900	3.0700	0	0	0.0	0.0000	0.0000		
18	27	29	0.6150	3.4800	1.6000	0	0	0.0	0.0000	0.0000		
19	29	31	1.2100	6.8100	0.7800	0	0	0.0	0.0000	0.0000		
1911	29	31	1.2100	6.8100	0.7800	0	0	0.0	0.0000	0.0000		
20	27	33	0.8750	4.9350	2.2600	0	0	0.0	0.0000	0.0000		
21	33	35	0.9150	5.1700	2.3700	0	0	0.0	0.0000	0.0000		
22	35	37	1.1200	6.3350	2.9100	0	0	0.0	0.0000	0.0000		
23	37	39	1.4600	8.2500	3.7900	0	0	0.0	0.0000	0.0000		
24	39	41	1.0100	5.6900	2.6100	0	0	0.0	0.0000	0.0000		
25	41	43	0.4500	2.5300	1.1600	0	0	0.0	0.0000	0.0000		
26	41	21	2.4150	29.8350	20.3200	0	0	0.0	0.0000	0.0000		
27	13	5	0.0	0.0000	0.0000							
28	37	338	1.0650	6.0200	2.7500	0	0	0.0	0.0000	0.0000		
29	57	59	0.6950	3.9350	1.8000	0	0	0.0	0.0000	0.0000		
30	59	61	4.8300	39.2500	8.2950	0	0	0.0	0.0000	0.0000		
31	59	777	1.0100	8.2600	1.7450	0	0	0.0	0.0000	0.0000		
32	777	666	2.3300	18.9800	4.0100	0	0	0.0	0.0000	0.0000		
33	666	61	1.4400	11.8100	2.4750	0	0	0.0	0.0000	0.0000		
34	1	63	0.7700	4.2000	2.1100	0	0	0.0	0.0000	0.0000		
36	333	1	0.4600	2.6200	0.3200	0	0	0.0	0.0000	0.0000		
37	333	11	0.9500	5.2400	0.6450	0	0	0.0	0.0000	0.0000		
47	441	44	4.6600	6.4300	0.0001	0	0	0.0	0.0000	0.0000		
48	441	442	2.0000	2.7500	0.0001	0	0	0.0	0.0000	0.0000		
65	2230	22	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
66	2220	22	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
93	991	10	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
94	992	10	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
95	993	10	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
96	994	10	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
97	10	1001	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
98	10	1002	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
99	10	1003	0.0001	0.0100	0.0001	0	0	0.0	0.0000	0.0000		
111	801	8	5.1000	10.1000	0.0001	0	0	0.0	0.0000	0.0000		
104	995	10	0.0001	0.0500	0.0001	0	0	0.0	0.0000	0.0000		
209	4443	44	18.1200	22.8000	0.0150	0	0	0.0	0.0000	0.0000		
35	21	22	0.0000	13.4000	0.0000	0	0	0.0 AMX.S	1.0000	0.0000	F	
38	43	44	0.0000	16.2500	0.0000	0	0	0.0 AQAS.TN.R2	1.0170	0.0000	F	
39	29	30	0.0000	60.7000	0.0000	0	0	0.0 KARAK	0.9669	0.0000	F	
40	29	30	0.0000	60.8700	0.0000	0	0	0.0 KARAK	0.9669	0.0000	F	

BRANCH DATA (POSITIVE-SEQUENCE)

CODE	FROM	TO	R	X	Y/2	C C T		ID.	T A P		PHASE MODIFIER	
						OLD	NEW CAPACITY		REAL	INAG. F/T	C	R
41	9	10	0.0000	26.8400	0.0000	0	0	0.0 MARQA	1.0000	0.0000	F	
42	9	10	0.0000	27.7700	0.0000	0	0	0.0 MARQA	1.0000	0.0000	F	
43	7	8	0.0000	21.2800	0.0000	0	0	0.0 IRBID	0.9502	0.0000	F	
44	7	8	0.0000	20.8300	0.0000	0	0	0.0 IRBID	0.9502	0.0000	F	
45	1411	41	0.0000	7.8100	0.0000	0	0	0.0 AQABA	1.0500	0.0000	T	
46	42	41	0.0000	11.5050	0.0000	0	0	0.0 APTS	1.0337	0.0000	T	
49	440	442	0.0000	99.1700	0.0000	0	0	0.0 ACPS	0.9500	0.0000	F	
4911	440	442	0.0000	99.1700	0.0000	0	0	0.0 ACPS	1.0000	0.0000	F	
4912	440	442	0.0000	99.1700	0.0000	0	0	0.0 ACPS	1.0000	0.0000	F	
50	141	41	0.0000	7.8100	0.0000	0	0	0.0 AQABA	1.0500	0.0000	T	
52	39	40	0.0000	62.1200	0.0000	0	0	0.0 QUMIERA	1.0170	0.0000	F	
53	38	37	0.0000	30.0500	0.0000	0	0	0.0 MAAN	1.0000	0.0000	T	
54	24	23	0.0000	10.1050	0.0000	0	0	0.0 SUBEIMI	0.9600	0.0000	T	
55	31	32	0.0000	23.5300	0.0000	0	0	0.0 GHORSAFI	1.0000	0.0000	T	
56	31	32	0.0000	23.5300	0.0000	0	0	0.0 GHORSAFI	1.0000	0.0000	T	
57	330	30	0.0000	40.0000	0.0000	0	0	0.0 KARAK	1.0000	0.0000	T	
58	3301	30	0.0000	30.4000	0.0000	0	0	0.0 KARAK	1.0000	0.0000	T	
59	62	61	0.0000	32.9000	0.0000	0	0	0.0 RESHA	1.0500	0.0000	T	
61	61	621	0.0000	32.9000	0.0000	0	0	0.0 RESHA	1.0500	0.0000	F	
62	61	6621	0.0000	32.9000	0.0000	0	0	0.0 RESHA	1.0500	0.0000	F	
63	223	2230	0.0000	23.8100	0.0000	0	0	0.0 AMMSGT2	1.0000	0.0000	F	
64	222	2220	0.0000	23.8100	0.0000	0	0	0.0 AMMSGT1	0.9500	0.0000	F	
67	33		0.0000	25.0200	0.0000	0	0	0.0 ELHASA	0.9500	0.0000	T	
68	35	36	0.0000	23.5300	0.0000	0	0	0.0 RSHADYA	1.0000	0.0000	F	
69	27	28	0.0000	48.3000	0.0000	0	0	0.0 QATRAY	1.0000	0.0000	F	
70	61	662	0.0000	32.9000	0.0000	0	0	0.0 RESHA	1.0500	0.0000	F	
71	300	61	0.0000	78.0000	0.0000	0	0	0.0 RESHA	1.0000	0.0000	T	
72	17	20	0.0000	50.6800	0.0000	0	0	0.0 FUHIES	1.0000	0.0000	F	
73	17	18	0.0000	48.6000	0.0000	0	0	0.0 FUHIES	1.0000	0.0000	F	
74	17	18	0.0000	48.6000	0.0000	0	0	0.0 FUHIES	1.0000	0.0000	F	
75	17	18	0.0000	48.7000	0.0000	0	0	0.0 FUHIES	0.9835	0.0000	F	
76	1	111	0.0000	32.9000	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
77	1	2	0.0000	32.3300	0.0000	0	0	0.0 HTPS	1.0170	0.0000	F	
78	1	2	0.0000	34.1700	0.0000	0	0	0.0 HTPS	1.0170	0.0000	F	
79	1	1112	0.0000	32.9000	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
80	1	1113	0.0000	32.9000	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
81	1	1114	0.0000	14.6800	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
82	1	1115	0.0000	14.6800	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
83	1	1116	0.0000	14.6800	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
84	1	1117	0.0000	14.6800	0.0000	0	0	0.0 HTPS	1.0500	0.0000	F	
85	1	3	0.0000	32.9200	0.0000	0	0	0.0 HTPS	0.9502	0.0000	F	
86	1	4	0.0000	25.2000	0.0000	0	0	0.0 HTPS	0.9335	0.0000	F	
88	2	122	0.0000	40.7100	0.0000	0	0	0.0 HTPS	1.0000	0.0000	F	
89	91	991	0.0000	40.0000	0.0000	0	0	0.0 MARQGT3	0.9500	0.0000	F	
90	92	992	0.0000	40.0000	0.0000	0	0	0.0 MARQGT4	0.9500	0.0000	F	
91	93	993	0.0000	40.0000	0.0000	0	0	0.0 MARQGT5	0.9500	0.0000	F	
92	94	994	0.0000	40.0000	0.0000	0	0	0.0 MARQGT6	0.9500	0.0000	F	
103	95	995	0.0000	18.6100	0.0000	0	0	0.0 MARQA	0.9500	0.0000	F	
105	5	6	0.0000	31.0000	0.0000	0	0	0.0 REHAB	1.0500	0.0000	F	
106	5	6	0.0000	31.2500	0.0000	0	0	0.0 REHAB	1.0500	0.0000	F	

* BRANCH DATA (POSITIVE-SEQUENCE) *

CODE	FROM	TO	R	X	Y/2	C C T			ID.	T A P		PHASE MOD C
						OLD	NEW	CAPACITY		REAL	IMAG. F/T	
107	66	6	0.0000	23.0000	0.0000	0	0	0.0	REH-GY	1.0500	0.0000	T
108	660	6	0.0000	23.0000	0.0000	0	0	0.0	NEWREH	1.0500	0.0000	T
109	7	46	0.0000	8.0000	0.0000	0	0	0.0	IRBID	1.0000	0.0000	T
110	8	48	0.0000	126.0000	0.0000	0	0	0.0	IRBID	1.0000	0.0000	F
201	4412	4411	0.0000	77.0000	0.0000	0	0	0.0	A16.6	1.0000	0.0000	T
202	4412	4411	0.0000	77.0000	0.0000	0	0	0.0	A16.6	1.0000	0.0000	T
203	332	333	0.0000	30.0000	0.0000	0	0	0.0	ABDAI	1.0000	0.0000	T
204	332	333	0.0000	30.0000	0.0000	0	0	0.0	ABDAI	1.0000	0.0000	T
205	332	333	0.0000	30.0000	0.0000	0	0	0.0	ABDAI	1.0000	0.0000	T
207	441	4411	0.0000	96.4000	0.0000	0	0	0.0	AQABA	1.0000	0.0000	F
208	441	4411	0.0000	96.4000	0.0000	0	0	0.0	AQABA	1.0000	0.0000	F
210	12	11	0.0000	20.4100	0.0000	0	0	0.0	ASHRAF	0.9500	0.0000	T
211	12	11	0.0000	20.3600	0.0000	0	0	0.0	ASHRAF	0.9500	0.0000	T
212	59	60	0.0000	95.0000	0.0000	0	0	0.0	ASZRAQ	1.0000	0.0000	F
213	59	60	0.0000	95.0000	0.0000	0	0	0.0	ASZRAQ	1.0000	0.0000	F
214	16	15	0.0000	27.5500	0.0000	0	0	0.0	BAYAD	0.9600	0.0000	T
215	16	15	0.0000	26.9700	0.0000	0	0	0.0	BAYAD	0.9600	0.0000	T
216	16	15	0.0000	28.5400	0.0000	0	0	0.0	BAYAD	0.9600	0.0000	T
217	58	57	0.0000	12.5000	0.0000	0	0	0.0	KARAN	0.9837	0.0000	T
218	25	26	0.0000	28.5000	0.0000	0	0	0.0	QAIA	1.0170	0.0000	F
219	25	26	0.0000	28.4000	0.0000	0	0	0.0	QAIA	1.0170	0.0000	F
220	64	63	0.0000	15.5000	0.0000	0	0	0.0	SABBA	1.0000	0.0000	T
221	771		0.0000	95.2000	0.0000	0	0	0.0	SAFAYI	1.0000	0.0000	T
222	13	14	0.0000	20.3200	0.0000	0	0	0.0	SAHAB	1.0100	0.0000	F
223	13	14	0.0000	31.0000	0.0000	0	0	0.0	SAHAB	1.0100	0.0000	F
224	339	338	0.0000	15.6250	0.0000	0	0	0.0	SHED	1.0170	0.0000	T
681	138	139	0.0000	50.8500	0.0000	0	0	0.0	RASH-ZT	1.0000	0.0000	T
682	139	35	0.0000	-13.8600	0.0000	0	0	0.0	RASH-ZP	0.9670	0.0000	T
683	139	36	0.0000	37.3900	0.0000	0	0	0.0	RASH-ZS	1.0000	0.0000	F
684	666	661	0.0000	96.2000	0.0000	0	0	0.0	RUMASH	1.0000	0.0000	F

Appendix 3.5-1 Calculation of Power Flow and Angle (2/5)

(Node Data)

* NODE DATA *										
CODE	B-KV	EKS	PG	QG	PL	QL	C/R	ID		
1	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
25	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
27	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
35	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
37	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
39	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
41	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
43	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
57	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
338	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
59	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
61	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
777	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
666	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
63	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
333	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
441	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
44	0	0.0000	0.0000	0.0000	20.0000	12.0000	0.0000	0.0000	0.0000	0.0000
442	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2230	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0	0.0000	0.0000	0.0000	45.0000	28.7000	0.0000	0.0000	0.0000	0.0000
2220	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
991	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0	0.0000	0.0000	0.0000	82.0000	51.1000	0.0000	0.0000	0.0000	0.0000
992	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
993	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
994	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1001	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1002	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1003	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
801	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0	0.0000	0.0000	0.0000	84.5000	54.2000	-30.0000	0.0000	0.0000	0.0000
995	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4443	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	0	0.0000	0.0000	0.0000	21.5000	13.0000	0.0000	0.0000	0.0000	0.0000
1411	15	105.0000	130.0000	0.0000	0.0000	0.0000	0.0000	AQAB	0.0000	0.0000
42	0	0.0000	0.0000	0.0000	20.0000	10.4000	0.0000	0.0000	0.0000	0.0000
440	11	105.0000	10.0000	0.0000	0.0000	0.0000	0.0000	AQAB11R	0.0000	0.0000

* NODE DATA *

CODE	B-KV	ENS	PG	QG	PL	QL	C/R	ID		
141	15	105.0000	130.0000	0.0000	0.0000	0.0000	0.0000	AQABA15X	0.0000	0.0000
40	0	0.0000	0.0000	0.0000	6.5000	3.5000	0.0000		0.0000	0.0000
38	0	0.0000	0.0000	0.0000	12.0000	7.0000	0.0000		0.0000	0.0000
24	0	0.0000	0.0000	0.0000	55.5000	30.3000	0.0000		0.0000	0.0000
32	33	99.6700	14.0000	0.0000	33.5000	20.3000	0.0000	GHORSAF3	0.0000	0.0000
330	11	105.0000	16.0000	0.0000	0.0000	0.0000	0.0000	KARAK11K	0.0000	0.0000
3301	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
62	11	104.0000	30.0000	0.0000	0.0000	0.0000	0.0000	RESH11KV	0.0000	0.0000
621	11	104.0000	30.0000	0.0000	0.0000	0.0000	0.0000	RESHG2	0.0000	0.0000
6621	11	104.0000	30.0000	0.0000	0.0000	0.0000	0.0000	RESHG4	0.0000	0.0000
223	11	100.9700	30.0000	0.0000	0.0000	0.0000	0.0000	AMNSGT2	0.0000	0.0000
222	11	100.9700	30.0000	0.0000	0.0000	0.0000	0.0000	AMNSGT1	0.0000	0.0000
34	0	0.0000	0.0000	0.0000	8.7000	5.3000	0.0000		0.0000	0.0000
36	0	0.0000	0.0000	0.0000	17.5000	10.6000	0.0000		0.0000	0.0000
28	0	0.0000	0.0000	0.0000	5.5000	3.2000	0.0000		0.0000	0.0000
662	11	104.0000	30.0000	0.0000	0.0000	0.0000	0.0000	RESBAH	0.0000	0.0000
300	0	0.0000	0.0000	0.0000	1.0000	0.5000	0.0000		0.0000	0.0000
20	0	0.0000	0.0000	0.0000	6.0000	3.6000	0.0000		0.0000	0.0000
18	6	101.5000	0.0000	0.0000	0.0000	0.0000	0.0000	FBISEL	0.0000	0.0000
111	13	103.0000	24.0000	0.0000	0.0000	0.0000	0.0000	HTPSG1.8	0.0000	0.0000
2	0	0.0000	0.0000	0.0000	31.3000	19.0000	0.0000		0.0000	0.0000
1112	13	103.0000	24.0000	0.0000	0.0000	0.0000	0.0000	HTPSG2	0.0000	0.0000
1113	13	103.0000	24.0000	0.0000	0.0000	0.0000	0.0000	HTPSG3	0.0000	0.0000
1114	13	103.0000	56.0000	0.0000	0.0000	0.0000	0.0000	HTPSG4	0.0000	0.0000
1115	103.0000	56.0000	0.0000	0.0000	0.0000	0.0000	0.0000	HTPSG5	0.0000	0.0000
1116	13	103.0000	56.0000	0.0000	0.0000	0.0000	0.0000	HTPSG6	0.0000	0.0000
1117	13	103.0000	0.0000	0.0000	0.0000	0.0000	0.0000	HTPSG7	0.0000	0.0000
3	0	0.0000	0.0000	0.0000	24.0000	14.9000	0.0000		0.0000	0.0000
4	0	0.0000	0.0000	0.0000	24.0000	14.5000	0.0000		0.0000	0.0000
122	10	105.0000	17.0000	0.0000	0.0000	0.0000	0.0000	ZARQA10X	0.0000	0.0000
91	11	103.0900	16.0000	0.0000	0.0000	0.0000	0.0000	GAST3	0.0000	0.0000
92	11	103.0900	16.0000	0.0000	0.0000	0.0000	0.0000	GAST4	0.0000	0.0000
93	11	103.0900	16.0000	0.0000	0.0000	0.0000	0.0000	GAST5	0.0000	0.0000
94	11	103.0900	16.0000	0.0000	0.0000	0.0000	0.0000	GAST6	0.0000	0.0000
95	6	98.9900	10.0000	0.0000	0.0000	0.0000	0.0000	DIESEL	0.0000	0.0000
6	0	0.0000	0.0000	0.0000	26.3000	14.9000	0.0000		0.0000	0.0000
66	11	102.3400	30.0000	0.0000	0.0000	0.0000	0.0000	REN-GEN	0.0000	0.0000
660	11	0.0000	0.0000	31.6000	0.0000	0.0000	0.0000	NEWREN	0.0000	0.0000
46	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
48	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
4412	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
4411	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
332	0	0.0000	0.0000	0.0000	55.0000	33.3000	-30.0000		0.0000	0.0000
12	0	0.0000	0.0000	0.0000	76.5000	47.7000	0.0000		0.0000	0.0000
60	0	0.0000	0.0000	0.0000	5.5000	3.2000	0.0000		0.0000	0.0000
16	0	0.0000	0.0000	0.0000	102.0000	66.0000	-15.0000		0.0000	0.0000
58	0	0.0000	0.0000	0.0000	4.8000	3.2000	0.0000		0.0000	0.0000
26	0	0.0000	0.0000	0.0000	44.0000	25.8000	-30.0000		0.0000	0.0000
64	0	0.0000	0.0000	0.0000	26.0000	15.7000	0.0000		0.0000	0.0000
771	0	0.0000	0.0000	0.0000	1.5000	0.9000	0.0000		0.0000	0.0000

* NODE DATA *

CODE	B-KV	BKS	PG	QG	PL	QL	C/R	ID		
14	0	0.0000	0.0000	0.0000	30.0000	15.7000	-30.0000		0.0000	0.0000
339	0	0.0000	0.0000	0.0000	9.0000	5.4000	0.0000		0.0000	0.0000
138	0	0.0000	0.0000	0.0000	0.0000	0.0000	-7.5000		0.0000	0.0000
139	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000
661	0	0.0000	0.0000	0.0000	1.0000	0.6000	0.0000		0.0000	0.0000
TOTAL			841.0000	31.6000	881.1000	534.5001	-142.5000	C		

*** (PF-OUT) NAME=JRD2WF ; OLDN=JRD2WF ; REPLACED. ***

Appendix 3.5-1 Calculation of Power Flow and Angle (3/5)
(Power Flow Data)

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[JORDAN.PWF

] Page= 1

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0001 $ECALC DATA=BASE SWI=1117 NAME=JROPWF OLDN=JROPWF EPS=0.01
0002 * HEAD JORDAN POWER FLOW DATA
0003 CTLND1 CODE V PG QG PL QL
0004 ND1 222 100.97 30. 0.0
0005 ND1 223 100.97 30. 0.0
0006 ND1 1411 105. 130. 0.0
0007 ND1 440 105. 10. 0.0
0008 ND1 141 105. 130. 0.0
0009 ND1 95 98.99 10. 0.0
0010 ND1 18 101.5 0.0 0.0
0011 ND1 91 103.09 16.0 0.0
0012 ND1 92 103.09 16.0 0.0
0013 ND1 93 103.09 16.0 0.0
0014 ND1 94 103.09 16.0 0.0
0015 ND1 32 99.67 14.0 0.0
0016 ND1 111 103.0 24.0 0.0
0017 ND1 1112 103. 24.0 0.0
0018 ND1 1113 103. 24.0 0.0
0019 ND1 1114 103. 56.0 0.0
0020 ND1 1115 103. 56.0 0.0
0021 ND1 1116 103. 56.0 0.0
0022 * ND1 1117 14.8 56.7 0.0
0023 ND1 330 105. 16.0 0.0
0024 ND1 101 100. 3.0 0.0
0025 ND1 102 100. 6.0 0.0
0026 ND1 103 100. 9.0 0.0
0027 ND1 660 0. 0.0 31.6
0028 ND1 66 102.34 30.0 0.0
0029 ND1 62 104. 30.0 0.0
0030 ND1 6621 104. 30.0 0.0
0031 ND1 662 104. 30.0 0.0
0032 * ND1 622 100. 30.0 0.0
0033 ND1 621 104. 30.0 0.0
0034 ND1 122 105. 17.0 0.0
0035 CTLND2 CODE V PL QL CR
0036 CTLND3 CODE V
0037 ND3 1117 103.
0038 ND2 332 0. 55.0 33.3 -30.0
0039 ND2 22 0. 46.0 28.7
0040 ND2 44 0. 20.0 12.0
0041 ND2 12 0. 76.5 47.7
0042 ND2 42 0. 20.0 10.4
0043 ND2 60 0. 5.5 3.2
0044 ND2 16 0. 102.0 66.0 -15.0
0045 ND2 34 0. 8.7 5.3
0046 ND2 20 0. 6.0 3.6
0047 ND2 32 0. 33.5 20.3
0048 ND2 2 0. 31.3 19.0
0049 ND2 8 0. 84.5 54.2 -30.0
0050 ND2 3 0. 24.0 14.9
0051 ND2 4 0. 24.0 14.5
0052 ND2 30 0. 21.5 13.0
0053 ND2 58 0. 4.8 3.2
0054 ND2 38 0. 12.0 7.0
0055 ND2 10 0. 82.0 51.1
0056 ND2 101 0. 1.6 1.1
0057 ND2 103 0. 1.6 1.1
0058 ND2 26 0. 44.0 25.8 -30.0
0059 ND2 28 0. 5.5 3.2
0060 ND2 40 0. 6.5 3.5
0061 ND2 138 0. 0.0 0.0 -7.5
0062 ND2 6 0. 26.3 14.9
0063 ND2 300 0. 1.0 0.5

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Appendix 3.5-1 Calculation of Power Flow and Angle (4/5) (Power Flow)

JORDAN POWER FLOW SET

NODE = 105 BRANCH = 130 SLACK NODE = 1117 ITRMAX = 10 SIGMA = 0.0100

*** POWER FLOW ***

NODE	CODE	E(KV)	VOLTAGE		GENERATOR		LOAD		C/R(%)
			BE(%)	ANGLE	P(%)	Q(%)	P(%)	Q(%)	
	1	103.214	103.214	-4.579	0.000	0.000	0.000	-0.001	
	5	102.892	102.892	-5.825	0.000	0.000	0.000	0.000	
	7	101.558	101.558	-7.173	0.000	0.000	0.000	0.000	
	9	101.821	101.821	-5.155	0.000	0.000	0.000	0.000	
	13	102.062	102.062	-4.165	0.000	0.000	0.000	0.000	
	15	100.639	100.639	-5.490	0.000	0.000	0.000	0.000	
	17	100.612	100.612	-5.517	0.000	0.000	0.000	0.000	
	21	100.823	100.823	-5.017	0.000	0.000	0.000	0.001	
	11	99.786	99.786	-6.013	0.000	0.000	0.000	0.000	
	23	98.969	98.969	-6.238	0.000	0.000	0.000	0.000	
	25	100.780	100.780	-5.145	0.000	0.000	0.000	0.000	
	27	100.853	100.853	-3.821	0.000	0.000	0.000	0.000	
	29	100.467	100.467	-4.291	0.000	0.000	0.000	0.000	
	31	100.230	100.230	-4.657	0.000	0.000	0.000	0.000	
33	101.399	101.399	-2.021	0.000	0.000	0.000	0.000		
	35	102.210	102.210	0.085	0.000	0.000	0.000	0.000	
	37	103.452	103.452	3.233	0.000	0.000	0.000	0.000	
	39	105.962	105.962	8.097	0.000	0.000	0.000	0.000	
	41	108.026	108.026	11.510	0.000	0.000	0.000	-0.001	
	43	107.813	107.813	11.400	0.000	0.000	0.000	0.000	
	57	103.338	103.338	-1.259	0.000	0.000	0.000	0.000	
	338	103.204	103.204	2.957	0.000	0.000	0.000	0.000	
	59	104.445	104.445	0.954	0.000	0.000	0.000	0.000	
	61	108.578	108.578	12.407	0.000	0.000	0.000	0.000	
	777	105.448	105.448	3.356	0.000	0.000	0.000	0.000	
	656	107.524	107.524	8.933	0.000	0.000	0.000	0.000	
	63	102.402	102.402	-5.109	0.000	0.000	0.000	0.000	
	333	101.821	101.821	-5.571	0.000	0.000	0.000	0.000	
	441	105.361	105.361	10.801	0.000	0.000	0.000	0.000	
	44	104.698	104.698	10.556	0.000	0.000	20.000	12.000	
	442	105.646	105.646	10.904	0.000	0.000	0.000	0.000	
	2230	100.352	100.352	-3.954	0.000	0.000	0.001	-0.043	
	22	100.352	100.352	-3.955	0.000	0.000	46.000	28.766	
	2220	100.354	100.354	-3.954	0.000	0.000	0.002	0.056	
	991	103.076	103.076	-5.749	0.000	0.000	0.013	0.087	
	10	103.074	103.074	-5.749	0.000	0.000	81.971	51.162	
	992	103.076	103.076	-5.749	0.000	0.000	0.013	0.087	
	993	103.076	103.076	-5.749	0.000	0.000	0.013	0.087	
	994	103.076	103.076	-5.749	0.000	0.000	0.013	0.087	
	1001	103.074	103.074	-5.749	0.000	0.000	-0.014	-0.113	
	1002	103.074	103.074	-5.749	0.000	0.000	-0.014	-0.113	
	1003	103.074	103.074	-5.749	0.000	0.000	-0.014	-0.113	
	801	104.370	104.370	-11.747	0.000	0.000	0.000	0.000	
	8	104.370	104.370	-11.747	0.000	0.000	84.500	54.200	-32.679(-30.00)
	995	103.077	103.077	-5.747	0.000	0.000	-0.002	-0.015	

JORDAN POWER FLOW NET

NODE = 105 BRANCH = 130 SLACK NODE = 1117 ITMAX = 10 SIGMA = 0.0100

*** POWER FLOW ***

NODE	CODE	VOLTAGE			GENERATOR		LOAD		C/R(%)
		E(KV)	E (%)	ANGLE	P(%)	Q(%)	P(%)	Q(%)	
	4443	104.702	104.702	10.554	0.000	0.000	0.000	0.000	
	30	102.091	102.091	-5.194	0.000	0.000	21.500	13.000	
AQAB	1411	15.750	105.000	16.903	130.000	34.595	0.000	0.000	
	42	103.323	103.323	10.288	0.000	0.000	20.000	10.400	
AQABA11K	440	11.550	105.000	12.583	10.000	4.218	0.000	0.000	
AQABA15K	141	15.750	105.000	16.903	130.000	34.595	0.000	0.000	
	40	101.984	101.984	5.919	0.000	0.000	6.500	3.500	
	38	101.315	101.315	1.262	0.000	0.000	12.000	7.000	
	24	99.874	99.874	-9.360	0.000	0.000	55.500	30.300	
GEORSAF3	32	32.891	99.670	-5.973	14.000	15.776	33.500	20.300	
KARAK11K	330	11.550	105.000	-1.771	16.000	8.114	0.000	0.000	
	3301	102.091	102.091	-5.194	0.000	0.000	0.000	0.000	
RESH11KV	62	11.440	104.000	17.673	30.000	3.251	0.000	0.000	
RESHG2	621	11.440	104.000	17.673	30.000	3.251	0.000	0.000	
RESHG4	6621	11.440	104.000	17.673	30.000	3.251	0.000	0.000	
AMNSGT2	223	11.107	100.970	0.089	30.000	3.681	0.000	0.000	
AMNSGT1	222	11.107	100.970	-0.114	30.000	27.478	0.000	0.000	
	34	95.047	95.047	-3.251	0.000	0.000	8.700	5.300	
	36	102.140	102.140	-1.036	0.000	0.000	17.500	10.600	
	28	99.260	99.260	-5.342	0.000	0.000	5.500	3.200	
RESWAN	662	11.440	104.000	17.673	30.000	3.251	0.000	0.000	
	300	108.215	1082.027	0.000	0.000	1.000	0.500		
	20	98.717	98.717	-7.771	0.000	0.000	6.000	3.600	
FUHISEL	18	6.090	101.500	-5.517	0.000	0.000	0.000	-2.041	
HTPS13.8	111	13.390	103.000	-0.106	24.000	15.656	0.000	0.000	
	2	100.183	100.183	-5.918	0.000	0.000	31.300	19.000	
HTPSG2	1112	13.390	103.000	-0.106	24.000	15.656	0.000	0.000	
HTPSG3	1113	13.390	103.000	-0.106	24.000	15.656	0.000	0.000	
HTPSG4	1114	13.390	103.000	0.078	56.000	35.263	0.000	0.000	
HTPSG5	1115	13.390	103.000	0.078	56.000	35.263	0.000	0.000	
HTPSG6	1116	13.390	103.000	0.078	56.000	35.263	0.000	0.000	
HTPSG7	1117	13.390	103.000	0.000	55.062	35.188	0.000	0.000	
	3	103.621	103.621	-8.604	0.000	0.000	24.000	14.900	
	4	107.007	107.007	-7.509	0.000	0.000	24.800	14.500	
ZARQA10K	122	10.500	105.000	-2.146	17.000	12.984	0.000	0.000	
GAST3	91	11.340	103.090	-2.468	16.000	15.217	0.000	0.000	
GAST4	92	11.340	103.090	-2.468	16.000	15.217	0.000	0.000	
GAST5	93	11.340	103.090	-2.468	16.000	15.217	0.000	0.000	
GAST6	94	11.340	103.090	-2.468	16.000	15.217	0.000	0.000	
DIESEL	95	5.939	98.990	-4.754	10.000	6.373	0.000	0.000	
	6	102.864	102.864	-5.497	0.000	0.000	26.300	14.900	
REG-GEN	66	11.257	102.340	-1.551	30.000	20.497	0.000	0.000	
NEWREH	660	11.538	104.895	-5.497	0.000	31.600	0.000	0.000	
	46	101.558	101.558	-7.173	0.000	0.000	0.000	0.000	
	48	104.370	104.370	-11.747	0.000	0.000	0.000	0.000	

JORDAN POWER FLOW NET

NODE = 105 BRANCH = 130 SLACK NODE = 1117 ITMAX = 10 SIGMA = 0.0100

*** POWER FLOW ***

NODE	CODE	VOLTAGE			GENERATOR		LOAD		C/R(%)
		E(KV)	E (%)	ANGLE	P(%)	Q(%)	P(%)	Q(%)	
	4412	105.361	105.361	10.801	0.000	0.000	0.000	0.000	
	4411	105.361	105.361	10.801	0.000	0.000	0.000	0.000	
	332	101.437	101.437	-8.623	0.000	0.000	55.000	33.300	-30.868(-30.00
	12	99.880	99.880	-10.275	0.000	0.000	76.500	47.700	
	60	102.938	102.938	-0.438	0.000	0.000	5.500	3.200	
	16	99.679	99.679	-10.656	0.000	0.000	102.000	66.000	-14.904(-15.00
	58	104.666	104.666	-1.571	0.000	0.000	4.800	3.200	
	26	99.449	99.449	-8.787	0.000	0.000	44.000	25.800	-29.670(-30.00
	64	99.886	99.886	-7.367	0.000	0.000	26.000	15.700	
	771	104.620	104.620	2.635	0.000	0.000	1.500	0.900	
	14	102.905	102.905	-6.194	0.000	0.000	30.000	15.700	-31.768(-30.00
	339	100.631	100.631	2.168	0.000	0.000	9.000	5.400	
	138	110.193	110.193	0.710	0.000	0.000	0.000	0.000	-9.107(-7.50
	139	105.991	105.991	0.710	0.000	0.000	0.000	0.000	
	661	106.981	106.981	8.454	0.000	0.000	1.000	0.600	
TOTAL					896.662	461.729	881.083	532.592	-148.997(*****

Appendix 3.5-1 Calculation of Power Flow and Angle (5/5)
(Line Flow)

JORDAN POWER FLOW NET

*** LINE FLOW ***

BRANCH	FROM	TO	P ===> (%)	Q ===> (%)	I ===> (PB)	LOSS-P (%)	LOSS-Q (%)	CHARGE (%)	<=== P (%)	<=== Q (%)	<=== I (PB)
1	1	5	81.561	-3.885	0.7911	0.325	-1.236	-2.995	-81.235	2.649	0.7699
3	1	54.360	50.190	0.7168	0.226	-1.224	-2.459	-54.133	-51.414	0.7332	
6	1	13	-6.002	13.529	0.1434	0.038	-2.068	-2.276	6.040	-15.597	0.1639
34	1	63	-26.066	13.033	0.2824	0.066	-4.100	-4.460	-26.000	-17.133	0.3041
76	1	111	-24.000	-13.109	0.2650	0.000	2.546	0.000	24.000	15.656	0.2782
77	1	2	7.348	4.184	0.0819	0.000	0.224	0.000	-7.348	-3.959	0.0833
78	1	2	6.952	3.958	0.0775	0.000	0.212	0.000	-6.952	-3.746	0.0788
79	1	1112	-24.000	-13.109	0.2650	0.000	2.546	0.000	24.000	15.656	0.2782
80	1	1113	-24.000	-13.109	0.2650	0.000	2.546	0.000	24.000	15.656	0.2782
81	1	1114	-56.000	-29.203	0.6119	0.000	6.060	0.000	56.000	35.263	0.6425
82	1	1115	-56.000	-29.203	0.6119	0.000	6.060	0.000	56.000	35.263	0.6425
83	1	1116	-56.000	-29.203	0.6119	0.000	6.060	0.000	56.000	35.263	0.6425
84	1	1117	-55.062	-29.279	0.6042	0.000	5.909	0.000	55.062	35.188	0.6344
85	1	3	24.000	17.347	0.2869	0.000	2.447	0.000	-24.000	-14.900	0.2726
86	1	4	24.000	16.230	0.2807	0.000	1.730	0.000	-24.000	-14.500	0.2620
2	5	7	84.936	28.015	0.8692	0.436	-0.853	-3.219	-84.500	-28.868	0.8793
105	5	6	-1.857	-15.394	0.1507	0.000	0.776	0.000	1.857	16.170	0.1582
106	5	6	-1.843	-15.271	0.1495	0.000	0.770	0.000	1.843	16.041	0.1570
43	7	8	41.798	14.280	0.4349	0.000	3.634	0.000	-41.798	-10.645	0.4133
44	7	8	42.701	14.588	0.4443	0.000	3.713	0.000	-42.701	-10.875	0.4222
8	9	15	46.155	60.721	0.7491	0.180	-0.779	-1.763	-45.975	-61.501	0.7630
41	9	10	4.057	-4.733	0.0000	0.101	0.000	-4.057	4.833	0.0612	
42	9	10	3.921	-4.574	0.0592	0.000	0.097	0.000	-3.921	4.671	0.0592
11	13	21	65.574	36.910	0.2373	0.257	0.771	-0.648	-65.318	-36.139	0.7404
27	13	57	-101.614	-6.587	0.9977	0.928	0.178	-5.084	102.542	6.765	0.9945
222	13	14	18.122	-8.895	0.1978	0.000	0.811	0.000	-18.122	9.706	0.1998
223	13	14	11.878	-5.831	0.1296	0.000	0.532	0.000	-11.878	6.362	0.1309
9	15	17	6.001	1.113	0.0606	0.001	-0.746	-0.749	-6.000	-1.860	0.0624
10	15	21	-62.026	-2.789	0.6169	0.093	-0.802	-1.319	62.120	1.988	0.6164
214	15	16	34.150	21.152	0.3992	0.000	4.045	0.000	-34.150	-17.107	0.3832
215	15	16	34.884	21.607	0.4077	0.000	4.132	0.000	-34.884	-17.475	0.3914
216	15	16	32.965	20.419	0.3853	0.000	3.905	0.000	-32.965	-16.514	0.3699
72	17	20	6.000	3.855	0.0709	0.000	0.255	0.000	-6.000	-3.600	0.0709
73	17	18	0.000	-1.838	0.0183	0.000	0.016	0.000	0.000	1.854	0.0183
74	17	18	0.000	-1.838	0.0183	0.000	0.016	0.000	0.000	1.854	0.0183
75	17	18	0.000	1.681	0.0167	0.000	0.013	0.000	0.000	-1.667	0.0164
15	21	23	-55.824	32.062	0.6385	0.324	-2.289	-4.692	-55.500	-34.351	0.6395
16	21	25	9.852	-0.956	0.0982	0.004	-2.132	-2.154	-9.848	-1.176	0.0984
35	21	22	-13.989	3.674	0.1435	0.000	0.276	0.000	13.989	-3.398	0.1435
13	11	21	-55.212	-20.527	0.5903	0.212	0.351	-0.825	55.423	20.878	0.5874
210	11	12	38.203	27.968	0.4745	0.000	4.147	0.000	-38.203	-23.821	0.4508
211	11	12	38.297	28.036	0.4756	0.000	4.157	0.000	-38.297	-23.879	0.4519
54	23	24	55.500	34.351	0.6595	0.000	4.050	0.000	-55.500	-30.300	0.6331
17	25	27	-34.152	2.240	0.3396	0.139	-5.453	-6.241	34.291	-7.694	0.3485
218	25	26	21.961	-0.531	0.2180	0.000	1.401	0.000	-21.961	1.932	0.2217

JORDAN POWER FLOW NET

*** LINE FLOW ***

BRANCH	FROM	TO	P ==> (\$)	Q ==> (\$)	I ==> (PW)	LOSS-P (\$)	LOSS-Q (\$)	CHARGE (\$)	<== P (\$)	<== Q (\$)	<== I (PW)
219	25	26	22.039	-0.533	0.2187	0.000	1.406	0.000	-22.039	1.939	0.2225
18	27	29	25.054	5.227	0.2539	0.041	-3.011	-3.242	-25.024	-8.238	0.2622
20	27	33	-64.855	-0.932	0.6431	0.362	-2.581	-4.622	65.218	-1.649	0.6434
69	27	28	5.500	3.398	0.0641	0.000	0.198	0.000	-5.500	-3.200	0.0641
19	29	31	9.762	0.995	0.0977	0.012	-1.504	-1.571	-9.750	-2.499	0.1004
1911	29	31	9.762	0.995	0.0977	0.012	-1.504	-1.571	-9.750	-2.499	0.1004
39	29	30	2.754	3.129	0.0415	0.000	0.098	0.000	-2.754	-3.031	0.0401
40	29	30	2.746	3.120	0.0414	0.000	0.097	0.000	-2.746	-3.023	0.0400
21	33	35	-73.917	-3.910	0.7300	0.486	-2.164	-4.913	74.404	1.746	0.7282
22	35	37	-91.904	-4.319	0.9002	0.505	-1.032	-6.154	92.810	3.288	0.8977
68	35	36	8.678	0.386	0.0850	0.000	0.170	0.000	-8.678	-0.216	0.0850
682	35	139	8.822	2.187	0.0889	0.000	-0.103	0.000	-8.822	-2.290	0.0860
23	37	39	-113.818	-10.600	1.1050	1.773	1.708	-8.312	115.591	12.308	1.0970
28	37	338	9.009	-0.252	0.0871	0.009	-5.822	-5.872	-9.000	-5.570	0.1026
53	37	38	12.000	7.565	0.1371	0.000	0.565	0.000	-12.000	-7.000	0.1371
24	39	41	-122.091	-16.134	1.1622	1.357	1.666	-5.976	123.448	17.800	1.1546
52	39	40	6.500	3.826	0.0712	0.000	0.326	0.000	-6.500	-3.500	0.0724
25	41	43	10.074	5.970	0.1084	0.006	-2.668	-2.702	-10.068	-8.639	0.1230
26	41	21	106.478	8.833	0.9891	2.565	-12.675	-44.368	-103.913	-21.507	1.0525
45	41	1411	-130.000	-21.775	1.2202	0.000	12.820	0.000	130.000	34.595	1.2812
46	41	42	20.000	10.948	0.2111	0.000	0.548	0.000	-20.000	-10.400	0.2182
50	41	141	-130.000	-21.775	1.2202	0.000	12.820	0.000	130.000	34.595	1.2812
38	43	44	10.068	8.638	0.1230	0.000	0.254	0.000	-10.068	-8.384	0.1251
29	57	59	-107.342	-10.003	1.0433	0.754	0.384	-3.886	108.096	10.387	1.0397
217	57	58	4.800	3.238	0.0560	0.000	0.038	0.000	-4.800	-3.200	0.0551
224	338	339	9.000	5.570	0.1026	0.000	0.170	0.000	-9.000	-5.400	0.1043
30	59	61	-57.149	-7.262	0.5516	1.447	-7.065	-18.828	58.597	0.196	0.5397
31	59	777	-56.447	-6.507	0.5440	0.297	-1.415	-3.844	56.744	5.092	0.5403
212	59	60	2.750	1.691	0.0309	0.000	0.091	0.000	-2.750	-1.600	0.0309
213	59	60	2.750	1.691	0.0309	0.000	0.091	0.000	-2.750	-1.600	0.0309
59	61	62	-30.000	-0.482	0.2763	0.000	2.770	0.000	30.000	3.252	0.2902
61	61	621	-30.000	-0.482	0.2763	0.000	2.770	0.000	30.000	3.252	0.2902
62	61	6621	-30.000	-0.482	0.2763	0.000	2.770	0.000	30.000	3.252	0.2902
70	61	662	-30.000	-0.482	0.2763	0.000	2.770	0.000	30.000	3.252	0.2902
71	61	300	1.000	0.508	0.0103	0.000	0.008	0.000	-1.000	-0.500	0.0103
32	777	666	-58.244	-6.019	0.5553	0.711	-3.300	-9.055	58.955	2.718	0.5489
221	777	771	1.500	0.927	0.0167	0.000	0.027	0.000	-1.500	-0.900	0.0167
33	666	61	-59.955	-3.330	0.5585	0.418	-2.107	-5.779	60.403	1.223	0.5564
684	666	661	1.000	0.611	0.0109	0.000	0.011	0.000	-1.000	-0.600	0.0109
220	63	64	26.000	17.133	0.3041	0.000	1.433	0.000	-26.000	-15.700	0.3041
36	333	1	-76.447	-40.420	0.8493	0.331	1.210	-0.673	76.778	41.631	0.8462
37	333	11	21.447	35.043	0.4035	0.159	-0.434	-1.311	-21.288	-35.476	0.4146
203	333	332	18.333	1.792	0.1809	0.000	0.982	0.000	-18.333	-0.811	0.1809
204	333	332	18.333	1.792	0.1809	0.000	0.982	0.000	-18.333	-0.811	0.1809
205	333	332	18.333	1.792	0.1809	0.000	0.982	0.000	-18.333	-0.811	0.1809

JORDAN POWER FLOW NET

*** LINE FLOW ***

BRANCH	FROM	TO	P ---> (\$)	Q ---> (\$)	I ---> (PW)	LOSS-P (\$)	LOSS-Q (\$)	CHARGE (\$)	<--- P (\$)	<--- Q (\$)	<--- I (PW)
47	441	44	9.980	3.648	0.1008	0.047	0.065	0.000	-9.932	-3.583	0.1008
48	441	442	-9.980	-3.649	0.1009	0.020	0.028	0.000	10.000	3.676	0.1008
207	441	4411	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
208	441	4411	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
65	2230	22	29.996	1.542	0.2993	0.000	0.001	0.000	-29.996	-1.541	0.2993
66	2220	22	30.001	23.967	0.3826	0.000	0.001	0.000	-30.001	-23.966	0.3826
93	991	10	15.994	13.498	0.2030	0.000	0.000	0.000	-15.994	-13.498	0.2030
97	10	1001	-0.009	-0.078	0.0008	0.000	0.000	0.000	0.009	0.078	0.0008
98	10	1002	-0.009	-0.078	0.0008	0.000	0.000	0.000	0.009	0.078	0.0008
99	10	1003	-0.009	-0.078	0.0008	0.000	0.000	0.000	0.009	0.078	0.0008
94	992	10	15.994	13.498	0.2030	0.000	0.000	0.000	-15.994	-13.498	0.2030
95	993	10	15.994	13.498	0.2030	0.000	0.000	0.000	-15.994	-13.498	0.2030
96	994	10	15.994	13.498	0.2030	0.000	0.000	0.000	-15.994	-13.498	0.2030
111	801	8	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
110	8	48	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
104	995	10	10.001	6.151	0.1139	0.000	0.000	0.000	-10.001	-6.151	0.1139
209	4443	44	0.000	0.000	0.0000	0.000	-0.033	-0.033	0.000	-0.033	0.0003
57	30	330	-16.000	-6.946	0.1709	0.000	1.168	0.000	16.000	8.114	0.1709
58	30	3301	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
49	440	442	3.448	5.490	0.0617	0.000	0.341	0.000	-3.448	-5.148	0.0587
4911	440	442	3.276	-0.636	0.0318	0.000	0.100	0.000	-3.276	0.736	0.0318
4912	440	442	3.2636	0.0318	0.000	0.100	0.000	-3.276	0.736	0.0318	
55	32	31	-9.750	-2.262	0.1004	0.000	0.237	0.000	9.750	2.499	0.1004
56	32	31	-9.750	-2.262	0.1004	0.000	0.237	0.000	9.750	2.499	0.1004
63	223	2230	30.000	3.681	0.2993	0.000	2.134	0.000	-30.000	-1.547	0.2993
64	222	2220	30.000	27.477	0.4029	0.000	3.488	0.000	-30.000	-23.989	0.3828
67	34	33	-8.700	-5.300	0.1072	0.000	0.259	0.000	8.700	5.559	0.1078
88	2	122	-17.000	-11.295	0.2037	0.000	1.690	0.000	17.000	12.984	0.2037
89	91	991	16.000	15.217	0.2142	0.000	1.656	0.000	-16.000	-13.561	0.2035
90	92	992	16.000	15.217	0.2142	0.000	1.656	0.000	-16.000	-13.561	0.2035
91	93	993	16.000	15.217	0.2142	0.000	1.656	0.000	-16.000	-13.561	0.2035
92	94	994	16.000	15.217	0.2142	0.000	1.656	0.000	-16.000	-13.561	0.2035
103	95	995	10.000	6.373	0.1198	0.000	0.241	0.000	-10.000	-6.132	0.1138
107	6	66	-30.000	-17.598	0.3381	0.000	2.899	0.000	30.000	20.497	0.3550
108	6	660	0.000	-29.513	0.2869	0.000	2.087	0.000	0.000	31.600	0.3013
109	46	7	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
201	4411	4412	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
202	4411	4412	0.000	0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.0000
681	139	138	0.000	-8.760	0.0826	0.000	0.347	0.000	0.000	9.107	0.0826
683	139	36	8.822	11.049	0.1334	0.000	0.665	0.000	-8.822	-10.384	0.1334

TOTAL LOSS 14.973 78.264 -171.039

ITERATION 11 NMIN= 8.6455E-01 IT= 1

Appendix 3.5-2 Monitoring Data of Power Demand and Power Factor in Jordan System

(1) Operating Data on Sep. 19-21, 1996

pf_nep33

Generation Record		MW	MVar		MVar	pf (%)	Load MVA
Total power at sending end		759.3			484.4	84.3	900.7
Substation Record	Capacity MVA	Tr Load MW	Tr Load Mvar	Capacitor Mvar	Load MVar	pf (%)	Load MVA
132/33 kV Substation Irbid	1*60+2*30	56.0	8.0	30.0	38.0	82.7	67.7
QAIA	2*45	29.0	-13.0	30.0	17.0	86.3	33.6
Bayader	3*45	92.0	50.0	15.0	65.0	81.7	112.6
Rehab *	2*40	22.0	-19.0	35.0	16.0	80.9	27.2
Zarqa	3*40	61.0	43.0		43.0	81.7	74.6
Karak	2*16	9.0	7.0		7.0	78.9	11.4
Amman south	2*45	61.0	37.0		37.0	85.5	71.3
Subeihi	2*63	59.0	27.0		27.0	90.9	64.9
Sabha	2*40	23.0	11.0		11.0	90.2	25.5

* Rehab Generation : 0 MW + 35 MVar :

(2) Record of Irbid substation

Date and time	132/33 kV trans		capacitor MVar	total MVar	Send out pf (%)	Power factor of Transformer
	MW	MVar				
Sep.18 1996 1:00	49.0	12.0	15.0	27.0	87.6	97.1
2:00	43.0	11.0	15.0	26.0	85.6	96.9
3:00	44.0	16.0	7.0	23.0	88.6	94.0
4:00	43.0	16.0	7.0	23.0	88.2	93.7
5:00	39.0	20.0	0.0	20.0	89.0	89.0
6:00	45.0	24.0	0.0	24.0	88.2	88.2
7:00	44.0	17.0	7.0	24.0	87.8	93.3
8:00	47.0	1.0	30.0	31.0	83.5	100.0
9:00	52.0	6.0	30.0	36.0	82.2	99.3
10:00	56.0	9.0	30.0	39.0	82.1	98.7
11:00	58.0	10.0	30.0	40.0	82.3	98.5
12:00	58.0	10.0	30.0	40.0	82.3	98.5
13:00	58.0	10.0	30.0	40.0	82.3	98.5
14:00	56.0	9.0	30.0	39.0	82.1	98.7
15:00	54.0	9.0	30.0	39.0	81.1	98.6
16:00	53.0	6.0	31.0	37.0	82.0	99.4
17:00	51.0	5.0	31.0	36.0	81.7	99.5
18:00	51.0	5.0	31.0	36.0	81.7	99.5
19:00	71.0	24.0	31.0	55.0	79.1	94.7
19:30	77.0	25.0	31.0	56.0	80.9	95.1
20:00	76.0	24.0	31.0	55.0	81.0	95.4
21:00	71.0	20.0	31.0	51.0	81.2	96.3
22:00	66.0	12.0	31.0	43.0	83.8	98.4
23:00	63.0	10.0	31.0	41.0	83.8	98.8
24:00	55.0	10.0	30.0	40.0	80.9	98.4
mean value	54.3	12.3	22.0	34.3	84.5	97.5

Monthly Power Factor of 33 kV Wadi Arab Feeder	June	July	August	Sent to
Total kWh and kVarh for moth in 1996 (%)	88.7	88.6	88.4	J V north area

CHAPTER 4

PRESENT SITUATIONS OF ELECTRIC POWER LOSS



Appendix 4.2-1 Measured data of feeder at Juhfia

Time	Current (Ampere)			Neutral	Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C		Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
12:00	112.6	125.9	127.7	14.05	402.7	401.5	402	38,990	0.774	0.986	0.877	0.905
13:00	104.8	142.6	140.5	44.9	402.5	401.1	402.2	72,300	0.764	0.836	0.812	0.807
14:00	105.5	137	121.4	31.31	404.3	403.3	403.9	67,950	0.77	0.824	0.811	0.804
15:00	116.8	133.7	133.5	17.95	405.9	404.4	405.4	66,480	0.771	0.81	0.802	0.796
16:00	103.4	133.2	128.8	26.46	406.8	405.6	406.2	64,910	0.769	0.803	0.799	0.792
17:00	111.3	132.6	119.6	19.17	406.9	406.3	407	63,540	0.764	0.797	0.798	0.787
18:00	106.2	138.4	116.7	27.48	405.1	403.9	404.6	64,110	0.761	0.795	0.796	0.785
19:00	110.6	142.4	125.8	23.1	403.1	402.1	402.5	67,780	0.755	0.794	0.794	0.783
20:00	213.8	260	279	58.6	394.6	392.6	393.3	132,100	0.752	0.792	0.792	0.78
21:00	199	238	277	77.9	396.1	394	394.3	130,200	0.756	0.794	0.799	0.785
22:00	177	220	262	82.5	399.5	397.9	397.9	119,200	0.753	0.793	0.804	0.784
23:00	161	189.6	231	63.1	399.9	398.2	398.5	106,000	0.751	0.793	0.807	0.786
0:00	140.4	187	217	64.8	402.2	399.6	399.8	102,500	0.75	0.794	0.808	0.787
1:00	132.2	172.3	203.3	69.39	404.8	403.1	403.3	95,410	0.75	0.794	0.808	0.787
2:00	108.6	142.6	179.6	64.64	406	404.6	404.4	79,510	0.749	0.792	0.809	0.787
3:00	111.2	128.4	161.2	41.37	405.6	404.2	403.7	67,230	0.746	0.791	0.808	0.785
4:00	104.3	124.2	149.7	37.42	407.5	406	405.6	66,580	0.743	0.789	0.807	0.784
5:00	111.3	125.5	152.8	35.72	406.7	405.5	405.1	68,700	0.74	0.788	0.806	0.782
6:00	87.1	109.3	110.3	15.24	405.8	404.7	404.9	57,620	0.739	0.786	0.804	0.781
7:00	88.1	112.6	112.1	26.36	406.3	405.6	405.5	52,520	0.739	0.784	0.802	0.779
8:00	98	114.6	104.2	21.45	408.3	407.6	407.6	49,080	0.737	0.783	0.801	0.777
9:00	90.9	105.8	114.1	14.15	402.3	401.8	401.2	54,200	0.737	0.782	0.8	0.776
10:00	116.9	133.9	148.6	27.37	400	399.2	398.9	67,160	0.738	0.784	0.8	0.777
11:00	91.6	134.4	139.4	45.33	401.3	400.3	400.8	71,240	0.74	0.785	0.8	0.779
12:00	122.9	131.6	149.2	30.38	402.8	401.8	401.8	74,160	0.742	0.787	0.801	0.78
13:00	112.4	114.6	146.3	36.35	403	402.7	401.7	72,600	0.745	0.788	0.803	0.782
14:00	94.3	112.8	110.8	21.32	403	402.8	402.7	63,720	0.745	0.788	0.804	0.782

Time	Current (Ampere)				Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
15:00	104.6	125.6	131.5	25.86	402.7	402.5	402.4	67,080	0.745	0.787	0.804	0.782
16:00	96.3	113.3	125	24.27	403	401.9	402.3	58,900	0.746	0.787	0.804	0.782
17:00	102.5	118.2	130.1	30.26	401.8	401	400.9	63,200	0.746	0.787	0.804	0.782
18:00	102.4	121.3	136.2	33.52	401.9	400.6	400.9	63,140	0.746	0.786	0.804	0.782
19:00	103.1	135.7	127.2	29.68	399.4	398.5	399	64,320	0.746	0.784	0.801	0.781
20:00	203.4	219.6	251	40	388.7	387.7	387.2	116,500	0.746	0.784	0.801	0.781
21:00	195.6	238	278	72.3	394.8	392.7	393.3	124,500	0.747	0.786	0.802	0.782
22:00	183.1	227	269	85.5	392.6	390.8	391	123,100	0.748	0.786	0.803	0.782
23:00	147.2	207	232	82.4	396.6	394.2	394.7	110,100	0.748	0.786	0.804	0.783
0:00	118.5	164.6	189.7	62.29	397.5	395.5	396.4	88,230	0.748	0.786	0.805	0.784
1:00	111.1	142	162.5	45.37	400.1	399.1	399.4	74,790	0.748	0.788	0.805	0.784
2:00	89.7	121.7	155.8	53.84	398.2	396.8	397	65,750	0.745	0.788	0.805	0.783
3:00	101.2	119.6	154.2	39.72	398.8	397.7	397.6	64,460	0.745	0.788	0.805	0.783
4:00	93.8	120.1	154.8	47.13	399.2	397.8	397.9	63,380	0.745	0.788	0.805	0.783
5:00	110.5	131.6	144.5	31.32	399	397.8	397.9	69,750	0.742	0.788	0.804	0.783
6:00	85.4	123.7	116.7	34.95	402.9	402	402.7	57,340	0.743	0.788	0.804	0.782
7:00	100.1	107	134.5	40.08	403.5	402.4	402.7	56,600	0.742	0.787	0.803	0.782
8:00	87.9	122.8	117.3	32.66	398.5	397.8	398.4	56,730	0.743	0.787	0.803	0.781
9:00	116.4	126.3	133.9	19.67	400.4	400.2	399.9	67,490	0.743	0.786	0.803	0.781
10:00	118.2	130.9	152.8	28.6	401	400.3	400.3	66,190	0.742	0.786	0.803	0.781
11:00	116.3	120.7	131.5	13.91	403	402.1	402.1	67,000	0.743	0.786	0.803	0.781
12:00	107.6	138.6	144.9	40.56	402.6	401.6	402	70,540	0.742	0.786	0.804	0.781
13:00	117.9	130.9	133.6	6.47	403	401.8	402.3	69,270	0.744	0.787	0.804	0.781
14:00	111.5	153.7	149.2	38.14	406.2	404.6	405.6	74,510	0.744	0.788	0.803	0.782
15:00	114.5	127.5	127.6	14.56	409.7	408.7	408.8	65,990	0.743	0.787	0.803	0.781
16:00	113.7	140	140.6	29.57	408.7	408	408.2	69,080	0.744	0.787	0.802	0.781
17:00	105.6	110.7	141.7	33	410.9	409	409.5	63,070	0.743	0.787	0.802	0.781
18:00	109.9	120.5	122.7	18.54	407.6	407.1	406.9	64,270	0.743	0.787	0.802	0.78
19:00	102.6	112.5	139.7	36.05	407.2	405.9	406.1	64,010	0.743	0.785	0.801	0.78
20:00	205.9	240	281	66.6	394.1	391.9	392.5	125,600	0.743	0.785	0.801	0.779
21:00	192	241	297	99.8	395.3	392.2	393.6	131,400	0.744	0.786	0.801	0.78

Time	Current (Ampere)			Line voltage (V)			Total demand (W)	Power factor				
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C		Phase C-A	Phase A	Phase B	Phase C	Average
22:00	171.8	230	264	81.8	396.8	394.4	395.3	122,600	0.744	0.786	0.802	0.781
23:00	139.7	204.8	209	60.3	401.1	398.7	400.1	105,400	0.744	0.786	0.803	0.781
0:00	120.7	166.5	189.5	53.81	401	399.2	399.6	87,900	0.744	0.787	0.803	0.781
1:00	108.1	141.8	164.7	47.11	400.4	399.2	399.2	75,690	0.744	0.787	0.803	0.781
2:00	98.5	137.7	154.8	50.74	402.9	401.6	401.9	69,230	0.743	0.787	0.803	0.781
3:00	103.9	114	149.4	35.03	400.2	399.2	398.6	66,620	0.743	0.787	0.803	0.781
4:00	110.5	135.1	140.5	30.85	401.8	401.1	401.1	68,220	0.743	0.787	0.802	0.781
5:00	101.9	133.2	154.2	45.95	401.5	400.2	400	69,980	0.742	0.787	0.803	0.781
6:00	103.6	113.8	128.8	23.57	405	404	404.3	61,320	0.742	0.786	0.802	0.781
7:00	89.4	98	130.3	40.03	404.1	403.5	403.1	57,130	0.742	0.786	0.802	0.78
8:00	108.6	133	128.3	30.89	403.8	403	403.3	60,590	0.742	0.786	0.802	0.78
9:00	107	121.4	142.4	33.48	399.1	397.9	398.1	69,710	0.742	0.786	0.802	0.78
10:00	108.4	124.1	138.7	31.02	399.2	398.2	398.7	69,740	0.742	0.786	0.802	0.781
11:00	110.1	127.5	147.1	31.79	403.7	402.4	403.1	73,440	0.743	0.787	0.803	0.781

Appendix 4.2-2 Measured data of feeder at Al-Rafeed

Time	Current (Ampere)				Line voltage (V)				Total demand		Power factor			
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A	Phase C-A	(W)	Phase A	Phase B	Phase C	Average	
14:00	90.8	127	160.3	63.51	406.4	402.5	403.7	403.7	80,340	0.868	0.869	0.884	0.876	
15:00	92.2	130.4	161.1	56.99	407.5	403.6	404.5	404.5	75,920	0.867	0.867	0.872	0.869	
16:00	93.9	145	167.9	57.64	408.1	404.5	405.2	405.2	84,450	0.869	0.869	0.871	0.87	
17:00	97.3	148.7	170.4	67.38	408.3	403.9	405.4	405.4	82,730	0.868	0.87	0.87	0.869	
18:00	96.6	130	161.6	60.6	407.6	403.7	403.8	403.8	79,000	0.868	0.869	0.868	0.869	
19:00	96.8	156.8	164.8	65.18	401.8	398.2	399.3	399.3	78,490	0.867	0.865	0.864	0.865	
20:00	194.6	281	265	63.6	382.9	378.3	379.6	379.6	131,300	0.857	0.859	0.856	0.857	
21:00	211.9	278	248	48.8	385.5	381.6	383.1	383.1	134,100	0.852	0.858	0.85	0.854	
22:00	200	258	246	43.5	390.1	386.3	386.9	386.9	131,800	0.849	0.856	0.847	0.85	
23:00	190.7	253	224	45.2	392.4	389.5	389.6	389.6	127,000	0.847	0.855	0.844	0.847	
0:00	157	218	190.7	41.6	397.7	394.7	395.3	395.3	111,700	0.846	0.855	0.842	0.848	
1:00	142.8	197	161.9	36.43	402	399.6	399.9	399.9	98,570	0.846	0.855	0.841	0.847	
2:00	133.8	175.9	136	33.74	404.9	403.1	402.3	402.3	86,700	0.846	0.854	0.838	0.846	
3:00	124.2	172.9	150.8	37.33	404.9	403.6	403.1	403.1	83,680	0.846	0.854	0.835	0.845	
4:00	121.7	178.2	128.1	43.68	406.4	405.2	405.1	405.1	82,560	0.845	0.853	0.833	0.844	
5:00	121.8	175.8	122.9	46.1	406	404.9	404.7	404.7	83,490	0.844	0.853	0.831	0.843	
6:00	112.4	158.6	123.5	27.89	408	406.3	406.3	406.3	75,280	0.844	0.853	0.83	0.843	
7:00	68.5	110.3	118.6	51.79	411.5	408.5	409.4	409.4	56,930	0.844	0.851	0.829	0.842	
8:00	64.6	100.5	107.4	39.89	413.9	411	411.6	411.6	54,000	0.844	0.85	0.829	0.841	
9:00	89.5	106.4	123.4	38.02	406.5	403.9	403.6	403.6	57,400	0.844	0.85	0.829	0.841	
10:00	97.1	128.9	142.7	39.51	402.3	400	400.3	400.3	76,100	0.846	0.85	0.83	0.842	
11:00	102.6	131.3	185	73.71	402.5	398.8	398.5	398.5	86,860	0.848	0.851	0.833	0.844	
12:00	108.7	137.5	172.7	61.77	404.1	400.5	400.6	400.6	84,840	0.85	0.852	0.836	0.846	
13:00	101.4	143.4	154.3	44.58	403.8	401.1	401	401	81,090	0.851	0.853	0.839	0.847	
14:00	97.3	137.4	162.1	55.94	404.6	401.2	401.8	401.8	81,170	0.852	0.854	0.84	0.849	
15:00	105.6	139.2	153.3	46.03	404.3	401.3	401.8	401.8	80,630	0.853	0.855	0.842	0.85	
16:00	88.3	143.4	163.8	67.56	403.9	400.2	400.9	400.9	81,170	0.854	0.853	0.845	0.85	

Time	Current (Ampere)				Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
17:00	92.6	156.3	178.3	77.19	403.6	399.6	400.5	84,310	0.854	0.856	0.843	0.851
18:00	91.2	134.5	156.3	58.76	404.7	401.3	401.8	77,560	0.855	0.856	0.842	0.852
19:00	93	150.4	163.4	69.12	399.3	395.5	396.5	81,360	0.856	0.855	0.843	0.852
20:00	194.2	271	256	63.9	377.8	373.7	374.5	129,700	0.854	0.856	0.842	0.851
21:00	207.9	278	256	55.2	383.3	379.6	380.1	134,100	0.853	0.855	0.843	0.851
22:00	200.3	255	244	47.7	382	379	378.9	129,100	0.852	0.856	0.843	0.85
23:00	182.9	239	211	34.3	388.9	386	386.6	121,800	0.853	0.855	0.843	0.85
0:00	155.5	219	172.7	51.5	393	390.8	392	105,300	0.853	0.855	0.843	0.85
1:00	139.8	178.9	143.6	26.16	399.3	397.8	397.7	90,880	0.853	0.855	0.842	0.85
2:00	124.9	168.9	141	31.78	397.2	395.5	395.3	84,910	0.853	0.855	0.841	0.85
3:00	114.6	160.3	129.6	28.48	399.2	397.4	397.8	78,990	0.853	0.855	0.841	0.85
4:00	120.9	168.5	134.1	32.82	399.2	397.6	397.9	81,690	0.85	0.855	0.84	0.849
5:00	122	176.9	123.4	44.51	397.8	396.5	397.1	83,380	0.853	0.855	0.84	0.849
6:00	116.1	160.6	119.5	38.87	404	402.8	403.4	78,330	0.853	0.855	0.84	0.849
7:00	81.7	105.6	101.1	25.4	406.1	404	404.4	55,650	0.853	0.855	0.839	0.849
8:00	75.7	98	124.7	42.02	403.8	400.6	401.2	57,350	0.852	0.854	0.839	0.849
9:00	77.4	115.3	146.5	62.28	403.5	400.1	401.2	66,540	0.853	0.855	0.84	0.849
10:00	84.4	129.7	148.9	61.14	403.9	400.2	401.8	68,660	0.854	0.855	0.84	0.849
11:00	77.6	117.5	146.6	64.28	405	401	401.9	72,850	0.854	0.855	0.841	0.85
12:00	95.5	141.9	160.8	55.73	404.3	400.5	401.4	81,650	0.854	0.855	0.843	0.851
13:00	95.8	126.3	133.6	39.65	404.8	401.6	402.4	72,960	0.855	0.855	0.843	0.851
14:00	90	130.5	146.8	56.51	408.9	405.3	406.3	73,990	0.855	0.855	0.843	0.851
15:00	98.3	138.3	152.6	46.56	411.6	407.6	408	79,780	0.854	0.855	0.843	0.851
16:00	101	125.3	161.5	52.1	411.5	407	408	81,570	0.855	0.856	0.844	0.851
17:00	102.4	133.4	148.8	42.7	411.2	408	409	82,410	0.855	0.856	0.844	0.851
18:00	95.7	125.3	164.4	66.08	410.8	406.8	408	77,960	0.855	0.856	0.845	0.852
19:00	120.7	131.8	166.8	51.54	406.2	403.1	403.2	76,410	0.855	0.855	0.845	0.852
20:00	211.3	270	257	52	386.9	383.4	384.2	132,900	0.854	0.855	0.844	0.851
21:00	212.5	265	233	37.2	385.6	382.8	383.1	133,900	0.853	0.854	0.844	0.85
22:00	201.6	250	250	47.2	388.6	385.1	385.4	131,200	0.853	0.854	0.844	0.85
23:00	195.9	250	217	42.2	393.7	391.1	391.6	126,800	0.853	0.854	0.844	0.85

Time	Current (Ampere)			Line voltage (V)			Total demand (W)	Power factor				
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C		Phase C-A	Phase A	Phase B	Phase C	Average
0:00	159.7	213	175.1	40.6	397.8	396.3	396	107,400	0.853	0.854	0.844	0.85
1:00	143.9	179.7	146	24.37	399.8	398.5	398.6	92,360	0.853	0.854	0.843	0.85
2:00	127.8	179.5	132.1	43.06	398.4	397.4	397.6	86,650	0.852	0.853	0.843	0.85
3:00	126.6	159.7	133.6	23.52	401.3	400.1	399.6	83,330	0.853	0.853	0.842	0.849
4:00	133.5	182.6	152.7	33.09	399.8	398.2	398.2	50,300	0.852	0.853	0.842	0.849
5:00	132.3	170.3	137.9	20.59	402.9	401.3	401.8	84,280	0.852	0.853	0.842	0.849
6:00	76.8	107.1	110.1	38.33	411.9	409.6	410	58,720	0.853	0.853	0.842	0.849
7:00	86	114.8	125.2	42.41	406.8	404.6	405	59,480	0.853	0.853	0.841	0.849
8:00	84.7	99.7	116.8	37.6	406.7	404.1	404.3	60,190	0.853	0.852	0.842	0.849
9:00	80.6	113.5	126.4	46.45	403.1	400	400.5	64,750	0.854	0.852	0.842	0.849
10:00	87.3	133.5	168.3	67.31	405.1	401.5	402.2	75,130	0.854	0.852	0.842	0.849
11:00	99.7	137.3	162.2	53.87	404.3	401.1	401.7	80,710	0.854	0.853	0.843	0.85
12:00	93.1	129.4	159.4	56.29	406	402.5	402.7	78,150	0.855	0.855	0.843	0.85

Appendix 4.2-3 Measured data of feeder at West Theeoba

Time	Current (Ampere)				Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
13:00	128.1	106.8	102.9	29.96	374.3	379.8	373.6	58,770	0.791	0.751	0.771	0.772
14:00	126.2	114.8	100.5	20.98	366.7	370.9	367.5	58,380	0.792	0.753	0.771	0.773
15:00	122.2	105.9	92.9	24.55	366.3	371.8	367.8	53,610	0.794	0.753	0.771	0.773
16:00	117.1	104	94.5	18.2	366.9	370.2	367.4	54,620	0.794	0.755	0.771	0.774
17:00	107.2	98.1	100.3	16.78	384.3	384.5	383	51,210	0.794	0.756	0.771	0.775
18:00	111.7	96.2	94.4	17.45	391	394.4	392.9	51,950	0.794	0.755	0.771	0.774
19:00	130.6	96.7	111.5	32.7	397.3	399.6	393.6	53,970	0.794	0.753	0.768	0.773
20:00	289	255	255	38.9	365.6	369.9	364.6	128,000	0.791	0.753	0.768	0.772
21:00	284	254	252	39.9	363.5	367.6	362.4	130,400	0.794	0.755	0.768	0.773
22:00	248	225	224	31.3	364.6	366.2	363.1	118,200	0.795	0.756	0.768	0.773
23:00	191.9	170.3	177.1	30.01	372.8	374.4	371	92,040	0.795	0.757	0.768	0.774
0:00	161.5	141.9	138.7	25.94	380.5	382.6	380.2	75,820	0.796	0.758	0.768	0.774
1:00	133.1	130.7	121.4	11	387.6	389.9	390.8	65,280	0.796	0.758	0.767	0.774
2:00	133.3	117.5	117.3	18.6	394	397	395.3	62,130	0.795	0.758	0.766	0.773
3:00	129.1	118.1	111.6	15.6	392.9	396.5	395.5	61,190	0.794	0.757	0.766	0.773
4:00	120.5	115.3	109.7	9.49	398	400.2	400.4	59,970	0.794	0.757	0.765	0.772
5:00	131.2	115.6	117.7	17.03	397.8	400.5	398.5	62,890	0.793	0.757	0.764	0.772
6:00	103.7	85.4	81.2	24.16	402.3	406.9	403.6	56,460	0.792	0.756	0.763	0.771
7:00	91.6	89.1	72.6	24.87	399.7	406.4	405.1	42,000	0.791	0.756	0.763	0.77
8:00	101.5	90.3	96.9	14.8	393.1	394	391.9	45,400	0.79	0.755	0.761	0.769
9:00	111.4	87.7	73.6	31.21	369	375.5	369.4	46,390	0.79	0.755	0.761	0.769
10:00	113.4	90.2	89.4	23.11	366.3	370.2	365.9	51,140	0.791	0.755	0.761	0.769
11:00	122.1	90	94	30.97	368.2	371.4	365.1	50,920	0.791	0.755	0.762	0.77
12:00	117	96.1	96.8	17.15	365.3	367.5	364.9	52,140	0.792	0.755	0.762	0.77
13:00	133.5	110.7	94.5	29.46	373.6	380.1	374.4	57,180	0.793	0.756	0.762	0.771
14:00	114.2	103.3	105.4	9.39	375.6	377.2	376.3	57,810	0.794	0.757	0.763	0.771
15:00	118.6	100.4	82.3	31.83	374.8	382.5	377	52,050	0.794	0.757	0.763	0.771

Time	Current (Ampere)				Line voltage (V)				Total demand (W)	Power factor		
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A	Phase A		Phase B	Phase C	Average
16:00	116.8	104.1	102	15.54	384.1	386.1	383.6	0.794	54,150	0.758	0.763	0.772
17:00	113.8	94.7	93.4	17.59	389	392.7	389.1	0.794	52,470	0.757	0.763	0.772
18:00	115.5	105.9	89.6	22.74	389.1	394.6	392.9	0.794	52,950	0.757	0.763	0.771
19:00	131.1	109.1	107	22.07	400.3	404.7	400.9	0.793	55,830	0.756	0.762	0.771
20:00	286	260	267	32.9	375	377.6	374.3	0.792	130,400	0.756	0.761	0.77
21:00	294	267	258	43.7	374.7	380	374	0.792	135,300	0.756	0.76	0.77
22:00	280	253	252	43.5	382.8	387.7	382	0.792	133,300	0.756	0.76	0.77
23:00	217	194.3	192.9	37.5	388.1	391.2	386.9	0.792	108,600	0.756	0.759	0.77
0:00	158.5	155	149	13.87	392.2	394.2	393.6	0.792	84,490	0.757	0.758	0.77
1:00	147.6	139.7	129.1	19.19	392	394.7	394	0.792	73,410	0.757	0.758	0.769
2:00	133.7	124.2	113.8	20.59	389.5	394.5	392.8	0.792	64,120	0.757	0.758	0.769
3:00	123.3	117.3	116.3	11.63	387.7	389.5	389.3	0.792	60,630	0.757	0.757	0.769
4:00	115.8	124.5	114.3	5.83	390.3	391.6	393.8	0.792	58,240	0.757	0.757	0.769
5:00	120.3	112.8	107.4	18.21	388.3	392	390.6	0.791	58,130	0.757	0.756	0.769
6:00	96.2	88.3	66.9	25.89	398.2	404.3	402.2	0.791	52,560	0.757	0.756	0.768
7:00	98.2	83.3	70.4	23.62	402.9	408.3	405.7	0.79	38,910	0.756	0.755	0.768
8:00	93.2	79.8	78.3	16.86	401.2	404.2	402.2	0.79	40,670	0.756	0.755	0.767
9:00	99	79.2	73.4	24.15	396	399.8	395.4	0.789	42,750	0.755	0.754	0.766
10:00	118.9	95.5	95	25.98	398.3	401.8	397.2	0.788	50,630	0.755	0.754	0.766
11:00	109.6	96.6	94.2	17.98	405.8	410.2	407	0.788	54,190	0.755	0.753	0.766
12:00	116	101.9	95.5	21.61	404.4	409.9	406.6	0.788	54,560	0.755	0.753	0.766
13:00	110.2	96.3	87.5	20.05	406.9	411.7	409	0.787	53,500	0.755	0.753	0.765
14:00	111.1	102.1	93.9	11.99	405.1	408.4	407.6	0.787	52,880	0.754	0.752	0.765
15:00	113.2	103.9	92.1	15.7	401	404.8	403.2	0.787	55,830	0.754	0.752	0.765
16:00	127.5	105.9	88.8	31.8	403.6	411.6	406.5	0.787	56,470	0.754	0.752	0.765
17:00	126.7	107.5	102.5	24.88	406.8	411.8	407.4	0.786	58,750	0.754	0.752	0.764
18:00	126.2	104.3	104.8	30.79	411	416.3	410.2	0.786	57,550	0.753	0.751	0.764
19:00	139.2	117	112	35.3	410.3	417.2	410.4	0.786	60,520	0.753	0.75	0.764
20:00	296	268	272	35.8	382.8	385.2	381.7	0.786	137,400	0.753	0.749	0.763
21:00	302	271	280	39.5	381.7	384.7	380.1	0.786	145,700	0.753	0.749	0.763
22:00	278	246	258	43.4	386.3	388.8	383.4	0.786	137,800	0.753	0.749	0.764

Time	Current (Ampere)			Line voltage (V)			Total demand (W)	Power factor				
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C		Phase C-A	Phase A	Phase B	Phase C	Average
23:00	186.8	184.6	189.6	19.01	396.5	398.5	397.2	102,800	0.786	0.754	0.749	0.764
0:00	153.4	145.7	142.1	19.49	401.9	404	402.9	78,090	0.786	0.754	0.749	0.764
1:00	143.2	124.4	125.4	22.82	396.8	399	397.1	68,560	0.786	0.754	0.749	0.764
2:00	135.9	122.4	126.1	15.63	397.1	398.4	398.3	62,710	0.786	0.754	0.748	0.763
3:00	125.4	114.6	111.6	16.63	398.4	400.7	400.4	60,340	0.785	0.754	0.748	0.763
4:00	125.7	118.2	107.1	17.52	396.1	399.8	399.2	60,650	0.785	0.754	0.748	0.763
5:00	123.3	126.3	118.8	4.49	398.4	398.9	401	64,480	0.785	0.754	0.748	0.763
6:00	103.4	92.6	89.1	16.98	403.2	405.3	403.7	59,290	0.785	0.754	0.748	0.762
7:00	94.1	84	74.6	18.59	402.4	405.9	404.5	44,350	0.784	0.753	0.747	0.762
8:00	117.2	96.4	89.4	20.75	380.6	381.8	382.4	40,040	0.784	0.753	0.746	0.762
9:00	111	87.2	77.1	28.93	366.4	371.4	366.5	46,160	0.784	0.752	0.746	0.762
10:00	119.3	94.8	86.2	30.33	366.8	372.9	367	48,250	0.784	0.753	0.746	0.762
11:00	99	101.8	101.6	5.72	362.4	363.3	364.6	51,200	0.784	0.753	0.747	0.762
12:00	112.9	107.3	95.5	16.7	364.3	368	365.6	52,370	0.785	0.753	0.747	0.762

Appendix 4.2-4 Measured data of feeder at Abu-Zeghan

Time	Current (Ampere)			Neutral	Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C		Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
11:00	107	71.9	43.4	56.25	394.6	395.6	394.5	40,370	0.781	0.761	0.769	0.771
12:00	112.5	78.9	42.6	57.55	395.3	396.8	394.9	40,860	0.781	0.761	0.769	0.771
13:00	118.8	77.2	44.1	67.69	396.3	397.8	395.7	41,830	0.782	0.762	0.768	0.771
14:00	119.6	80.7	48.4	66.48	395.3	396.9	395.2	45,060	0.782	0.762	0.768	0.771
15:00	117.8	86.6	47.1	60.81	395.3	396.5	395.7	45,380	0.782	0.763	0.768	0.771
16:00	123.2	81.9	49.5	63.4	396.3	397.2	395.7	47,640	0.783	0.763	0.768	0.772
17:00	131.2	89	49.5	69.94	397.7	399.5	397.6	50,010	0.783	0.764	0.768	0.772
18:00	115.1	83.7	46.6	61.81	401.3	402.6	400.7	43,140	0.784	0.763	0.768	0.772
19:00	118.1	71.7	49.1	61.55	400	401.3	399.3	40,000	0.783	0.763	0.768	0.772
20:00	175.5	157.4	91.2	85.34	385.8	386.9	385.8	69,520	0.783	0.763	0.767	0.772
21:00	185.2	161.9	94.4	91.61	386.6	388	386.6	75,460	0.783	0.764	0.767	0.771
22:00	187.3	160.2	86.2	97.15	387	389	387.5	78,670	0.783	0.765	0.766	0.772
23:00	159.8	139.1	73.9	83.72	390.8	392.1	391.1	67,360	0.783	0.766	0.766	0.772
0:00	144.8	121.5	65	75.63	390.8	392	390.9	59,870	0.783	0.766	0.766	0.772
1:00	134.5	113	55.4	77.13	392.2	393.4	392.8	54,850	0.783	0.767	0.766	0.773
2:00	125.3	105.7	57.7	68.42	397.1	397.8	397	52,200	0.783	0.768	0.766	0.773
3:00	119.4	105.2	60.4	60.42	398.1	399	398	50,170	0.783	0.768	0.766	0.773
4:00	118	105.3	56.6	61.14	400.9	401.8	400.8	50,670	0.783	0.768	0.766	0.773
5:00	128.3	106.1	53	72.66	399.3	400.8	400	51,660	0.783	0.769	0.766	0.773
6:00	112.8	66.6	47.2	59.64	400.8	402.3	400.2	39,470	0.783	0.769	0.766	0.773
7:00	102.5	69.5	35.51	57.06	396.6	398.1	396.8	35,360	0.782	0.768	0.765	0.773
8:00	113.2	78.8	53.8	44.44	396.8	397.5	396.3	40,970	0.783	0.768	0.765	0.773
9:00	114.9	89.7	40.8	55.36	395.9	396.6	396	43,140	0.783	0.769	0.765	0.773
10:00	123.4	72.1	46.4	68.32	397.2	398.7	397.2	45,440	0.783	0.768	0.765	0.773
11:00	123.9	80.9	48.1	72.31	397	398.1	396.6	43,240	0.783	0.768	0.765	0.773
12:00	121	78.1	44.9	70.89	396.9	398.4	396.9	44,230	0.784	0.769	0.764	0.773
13:00	119.1	80.1	51.3	60.69	399	400.5	399	45,260	0.784	0.768	0.764	0.773

Time	Current (Ampere)				Line voltage (V)			Total demand		Power factor			
	Phase A	Phase B	Phase C	Neutral	Phase A-B	Phase B-C	Phase C-A	(W)	Phase A	Phase B	Phase C	Average	
14:00	128.3	83.3	57.4	67.29	398.8	400.7	398.5	46,600	0.784	0.769	0.764	0.773	
15:00	112.6	83.6	49.7	52.81	399.2	400.6	399.2	47,140	0.784	0.769	0.764	0.773	
16:00	120.1	92.6	53.3	49.52	401.5	402.7	401.5	47,530	0.785	0.769	0.764	0.774	
17:00	131.4	84.9	54.7	57.79	399.6	401	399.2	47,960	0.785	0.769	0.764	0.774	
18:00	122.2	77.2	50.1	64.94	401.1	402.7	400.8	46,650	0.785	0.769	0.764	0.774	
19:00	124.5	83	46.5	66.35	399.8	401.3	399.8	42,160	0.785	0.769	0.764	0.774	
20:00	170.9	162.6	86.3	88.27	387.1	388	387.1	69,740	0.785	0.769	0.763	0.773	
21:00	192.5	158.6	103.2	85.28	386.9	388.2	386.4	77,240	0.785	0.769	0.763	0.773	
22:00	169.8	167.8	94.1	88.95	390.6	391	390.7	75,150	0.784	0.769	0.763	0.773	
23:00	169.7	140.9	94.6	70.02	391.4	392.8	391.6	73,610	0.784	0.77	0.763	0.773	
0:00	150.5	124.6	78.2	72.51	395.9	397.2	395.7	64,390	0.784	0.77	0.763	0.773	
1:00	135.8	121.4	66.2	66.69	399	400.5	399.2	59,760	0.784	0.771	0.763	0.774	
2:00	123	110.4	57.8	64.53	400.8	402.3	401.1	54,640	0.784	0.771	0.762	0.774	
3:00	129.8	106.4	56.2	67.73	395.9	397.6	396.1	51,490	0.784	0.771	0.762	0.774	
4:00	123.8	102	57.6	62.31	397.7	399.1	397.7	51,850	0.784	0.772	0.762	0.774	
5:00	128	99.8	62.3	60.53	396.9	398.2	396.9	52,620	0.784	0.772	0.762	0.774	
6:00	118.1	71.6	47.3	64.71	402.5	403.9	401.8	41,670	0.785	0.772	0.762	0.774	
7:00	108	68.4	44.5	57.55	404.4	405.6	404.5	37,420	0.785	0.772	0.762	0.774	
8:00	107.6	66.3	47.7	48.93	403.4	404.9	402.6	37,210	0.785	0.772	0.761	0.774	
9:00	100.2	69.4	53.2	40.71	401.1	402	400.6	36,910	0.784	0.771	0.761	0.774	
10:00	130.3	81.2	56.7	68.58	397.9	399.6	397.2	47,680	0.784	0.771	0.761	0.774	
11:00	119.1	83.1	57.5	47.35	396.6	397.6	395.9	44,830	0.785	0.772	0.761	0.774	
12:00	131.8	79.9	54.3	64.75	396.6	398.2	396	48,910	0.785	0.772	0.761	0.774	
13:00	136.9	83	55.4	79.67	398	399.6	397.9	47,470	0.785	0.772	0.761	0.774	
14:00	137.1	72.8	53.2	77.85	397.7	399.2	397.3	48,840	0.785	0.772	0.761	0.774	
15:00	131.2	82.1	53.8	68.49	396.3	397.9	395.5	47,940	0.786	0.772	0.761	0.775	
16:00	132.5	70.9	59.6	67.73	394.6	396.2	393.8	48,090	0.786	0.772	0.761	0.775	
17:00	134.1	82.1	56.6	69.35	394.9	396.5	394.2	48,050	0.787	0.773	0.761	0.775	
18:00	122.8	72.3	50.7	62.71	395.1	396.7	394.5	45,370	0.787	0.773	0.761	0.775	
19:00	127.1	79	49.7	67.18	393.8	394.7	392.9	44,760	0.787	0.773	0.761	0.775	
20:00	188.6	149.4	106.2	71.14	382.3	383.1	381.2	73,340	0.786	0.772	0.761	0.775	

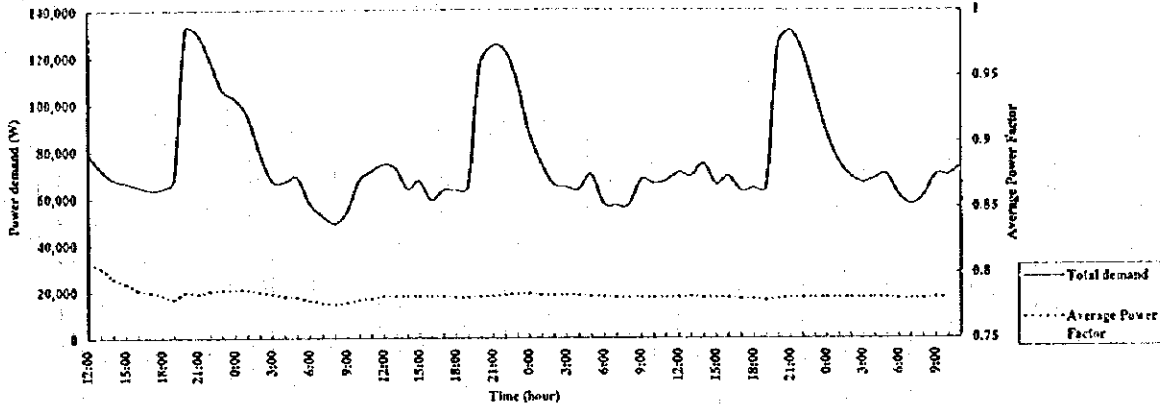
Time	Current (Ampere)			Line voltage (V)			Total demand (W)	Power factor			
	Phase A	Phase B	Phase C	Phase A-B	Phase B-C	Phase C-A		Phase A	Phase B	Phase C	Average
21:00	180.7	157.4	93	382	383.5	382	73,330	0.787	0.773	0.761	0.775
22:00	170.3	154.9	86.4	384.7	385.6	384.8	73,010	0.787	0.773	0.761	0.775
23:00	158.3	133.6	78.8	386.8	388.2	386.8	65,210	0.787	0.773	0.761	0.775
0:00	143.5	118.9	69	390.7	392	390.1	58,710	0.787	0.774	0.761	0.776
1:00	131.6	108.1	67.2	393.2	394	392.9	55,800	0.787	0.774	0.761	0.776
2:00	125.8	102.4	63.3	399.8	401.1	399.8	52,010	0.787	0.775	0.76	0.776
3:00	123.7	101.9	61.2	401.8	402.9	401.7	50,750	0.787	0.775	0.761	0.776
4:00	115	98.6	60.9	403.3	404.2	403.2	51,160	0.787	0.775	0.76	0.776
5:00	127.8	105.9	61.2	401.9	403.2	401.9	52,780	0.787	0.775	0.761	0.776
6:00	110.9	65.5	49.5	407	408.2	406.2	41,210	0.787	0.775	0.76	0.776
7:00	105.8	66.7	44.5	404.1	404.9	403.3	38,010	0.786	0.775	0.76	0.776
8:00	104	65.4	39.53	399.8	400.6	399.6	36,710	0.786	0.775	0.76	0.776
9:00	91	74.8	50.2	397.1	397.4	396.5	37,760	0.786	0.775	0.759	0.775
10:00	104.7	75.3	54.5	392.5	392.9	391.9	41,940	0.786	0.775	0.759	0.775

Appendix 4.2-5 Results of measurement in service wire and calculation of energy loss per energy load

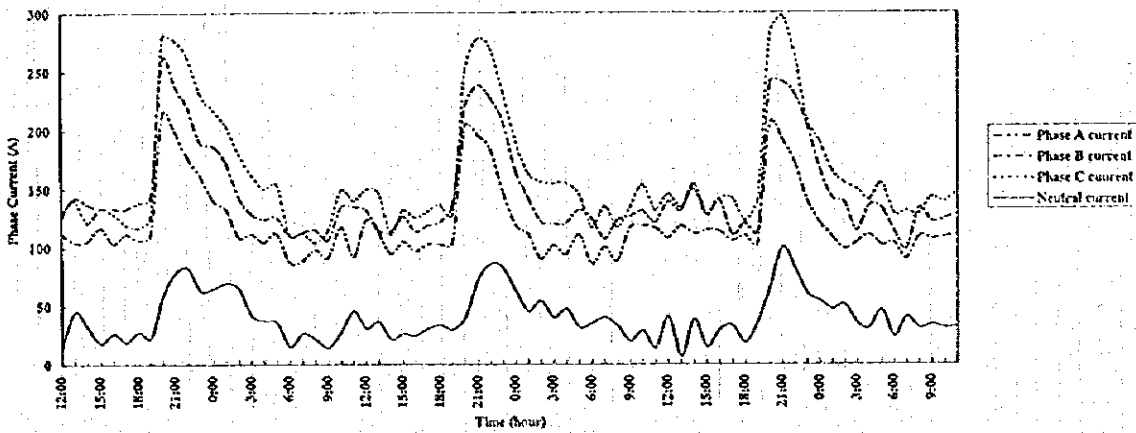
Substation name	Service wire				Loss factor c	Energy loss (Wh) $d=a^2 \cdot b \cdot c \cdot 8760$	Voltage to ground (V) e	Power factor f	Load factor in the year g	Energy load (Wh) $h=a \cdot e \cdot f \cdot g \cdot 8760$	dh	average
	Current (Ampere) a	Length (meter)	Conductor size (mm ² *number)	Resistance (Ohm) b								
Jubfa	11	10	Cu 6*2	0.015152	0.5783	9,287.5	227.2	0.781	0.715	12,225,375	0.00076	
	10	8	Cu 6*2	0.012121	0.5783	6,140.5	227.2	0.781	0.715	11,113,977	0.00055	
	5	8	Cu 6*2	0.012121	0.5783	1,535.1	227.2	0.781	0.715	5,556,989	0.00028	
	3	12	Cu 6*2	0.018182	0.5783	829.0	227.2	0.781	0.715	3,334,193	0.00025	
	2	30	Cu 6*2	0.045455	0.5783	921.1	227.2	0.781	0.715	2,222,795	0.00041	
	2.5	15	Cu 6*2	0.022727	0.5783	719.6	227.2	0.781	0.715	2,778,494	0.00026	
	3	8	Cu 6*2	0.012121	0.5783	552.6	227.2	0.781	0.715	3,334,193	0.00017	
	2.5	12	Cu 6*2	0.018182	0.5783	575.7	227.2	0.781	0.715	2,778,494	0.00021	
	1.5	20	Cu 6*2	0.030303	0.5783	345.4	227.2	0.781	0.715	1,667,097	0.00021	
	1.5	70	Cu 6*2	0.106061	0.5783	1,208.9	227.2	0.781	0.715	1,667,097	0.00073	
	3	14	Cu 6*2	0.021212	0.5783	967.1	227.2	0.781	0.715	3,334,193	0.00029	
	2.5	7	Cu 6*2	0.010606	0.5783	335.8	227.2	0.781	0.715	2,778,494	0.00012	
	4	9	Cu 6*2	0.013636	0.5783	1,105.3	227.2	0.781	0.715	4,445,591	0.00025	
	3	13	Cu 6*2	0.019697	0.5783	898.0	227.2	0.781	0.715	3,334,193	0.00027	
	4	8	Cu 6*2	0.012121	0.5783	982.5	227.2	0.781	0.715	4,445,591	0.00022	
	2.5	14	Cu 6*2	0.021212	0.5783	671.6	227.2	0.781	0.715	2,778,494	0.00024	
	3.5	21	Cu 6*2	0.031818	0.5783	1,974.6	227.2	0.781	0.715	3,889,892	0.00031	
	2	8	Cu 6*2	0.012121	0.5783	245.6	227.2	0.781	0.715	2,222,795	0.00011	
	2.5	9	Cu 6*2	0.013636	0.5783	431.8	227.2	0.781	0.715	2,778,494	0.00016	
	5	13	Cu 6*2	0.019697	0.5783	2,494.6	227.2	0.781	0.715	5,556,989	0.00045	
3	10	Cu 6*2	0.015152	0.5783	690.8	227.2	0.781	0.715	3,334,193	0.00021		
2.5	7	Cu 6*2	0.010606	0.5783	335.8	227.2	0.781	0.715	2,778,494	0.00012		
2.5	12	Cu 6*2	0.018182	0.5783	575.7	227.2	0.781	0.715	2,778,494	0.00021	0.0003	
Al-Rafeed	4	25	Cu 6*2	0.037879	0.5783	3,070.2	221	0.852	0.715	4,717,392	0.00065	
	5	30	Cu 6*2	0.045455	0.5783	5,756.7	221	0.852	0.715	5,896,741	0.00098	
	4	30	Cu 6*2	0.045455	0.5783	3,684.3	221	0.852	0.715	4,717,392	0.00078	
	3	20	Cu 6*2	0.030303	0.5783	1,381.6	221	0.852	0.715	3,538,044	0.00039	
	2.5	15	Cu 6*2	0.022727	0.5783	719.6	221	0.852	0.715	2,948,370	0.00024	
	3	20	Cu 6*2	0.030303	0.5783	1,381.6	221	0.852	0.715	3,538,044	0.00039	
	2	20	Cu 6*2	0.030303	0.5783	614.0	221	0.852	0.715	2,358,696	0.00026	
	5	20	Cu 6*2	0.030303	0.5783	3,837.8	221	0.852	0.715	5,896,741	0.00065	
	2.5	40	Cu 6*2	0.060606	0.5783	1,918.9	221	0.852	0.715	2,948,370	0.00065	
	3.5	25	Cu 6*2	0.037879	0.5783	2,350.7	221	0.852	0.715	4,127,718	0.00057	
	10	35	Cu 6*2	0.053030	0.5783	26,864.7	221	0.852	0.715	11,793,481	0.00228	
	2.5	20	Cu 6*2	0.030303	0.5783	959.5	221	0.852	0.715	2,948,370	0.00033	
	2	40	Cu 6*2	0.060606	0.5783	1,228.1	221	0.852	0.715	2,358,696	0.00052	
	4	28	Cu 6*2	0.042424	0.5783	3,438.7	221	0.852	0.715	4,717,392	0.00073	
	2.5	25	Cu 6*2	0.037879	0.5783	1,199.3	221	0.852	0.715	2,948,370	0.00041	
	2.5	15	Cu 6*2	0.022727	0.5783	719.6	221	0.852	0.715	2,948,370	0.00024	
	2.5	20	Cu 6*2	0.030303	0.5783	959.5	221	0.852	0.715	2,948,370	0.00033	
	3.5	25	Cu 6*2	0.037879	0.5783	2,350.7	221	0.852	0.715	4,127,718	0.00057	
	3	28	Cu 6*2	0.042424	0.5783	1,934.3	221	0.852	0.715	3,538,044	0.00055	
	6	30	Cu 6*2	0.045455	0.5783	8,289.7	221	0.852	0.715	7,076,089	0.00117	
4	30	Cu 6*2	0.045455	0.5783	3,684.3	221	0.852	0.715	4,717,392	0.00078		
4.5	25	Cu 6*2	0.037879	0.5783	3,885.8	221	0.852	0.715	5,307,057	0.00073		
5	15	Cu 6*4	0.011364	0.5783	1,439.2	221	0.852	0.715	5,896,741	0.00024		
10	15	Cu 6*4	0.011364	0.5783	5,756.7	221	0.852	0.715	11,793,481	0.00049		
8	15	Cu 6*4	0.011364	0.5783	3,684.3	221	0.852	0.715	9,434,785	0.00039		
3.5	20	Cu 6*2	0.030303	0.5783	1,890.5	221	0.852	0.715	4,127,718	0.00046		
2.5	17	Cu 6*2	0.025758	0.5783	815.5	221	0.852	0.715	2,948,370	0.00028		
4	20	Cu 6*2	0.030303	0.5783	2,456.2	221	0.852	0.715	4,717,392	0.00052	0.00059	
West Theheeba	3	25	Cu 6*1	0.075758	0.5783	3,454.0	216.1	0.769	0.715	3,122,572	0.00111	
	4	25	Cu 6*1	0.075758	0.5783	6,140.5	216.1	0.769	0.715	4,163,430	0.00147	
	2	25	Cu 6*1	0.075758	0.5783	1,535.1	216.1	0.769	0.715	2,081,715	0.00074	
	2	25	Cu 6*1	0.075758	0.5783	1,535.1	216.1	0.769	0.715	2,081,715	0.00074	
	3	25	Cu 6*1	0.075758	0.5783	3,454.0	216.1	0.769	0.715	3,122,572	0.00111	
	5	25	Cu 6*1	0.075758	0.5783	9,594.5	216.1	0.769	0.715	5,204,287	0.00184	
	6	25	Cu 6*1	0.075758	0.5783	13,816.1	216.1	0.769	0.715	6,245,145	0.00221	
	3	23	Cu 6*1	0.075758	0.5783	3,454.0	216.1	0.769	0.715	3,122,572	0.00111	
	6	25	Cu 6*1	0.075758	0.5783	13,816.1	216.1	0.769	0.715	6,245,145	0.00221	
	5	25	Cu 6*1	0.075758	0.5783	9,594.5	216.1	0.769	0.715	5,204,287	0.00184	
	4	25	Cu 6*1	0.075758	0.5783	6,140.5	216.1	0.769	0.715	4,163,430	0.00147	
	2	23	Cu 6*1	0.075758	0.5783	1,535.1	216.1	0.769	0.715	2,081,715	0.00074	
7	25	Cu 6*1	0.075758	0.5783	18,803.3	216.1	0.769	0.715	7,286,002	0.00258		
6	25	Cu 6*1	0.075758	0.5783	13,816.1	216.1	0.769	0.715	6,245,145	0.00221		
5	25	Cu 6*1	0.075758	0.5783	9,594.5	216.1	0.769	0.715	5,204,287	0.00184	0.00155	

Appendix 4.2-6 Result of measurement at Juhfia

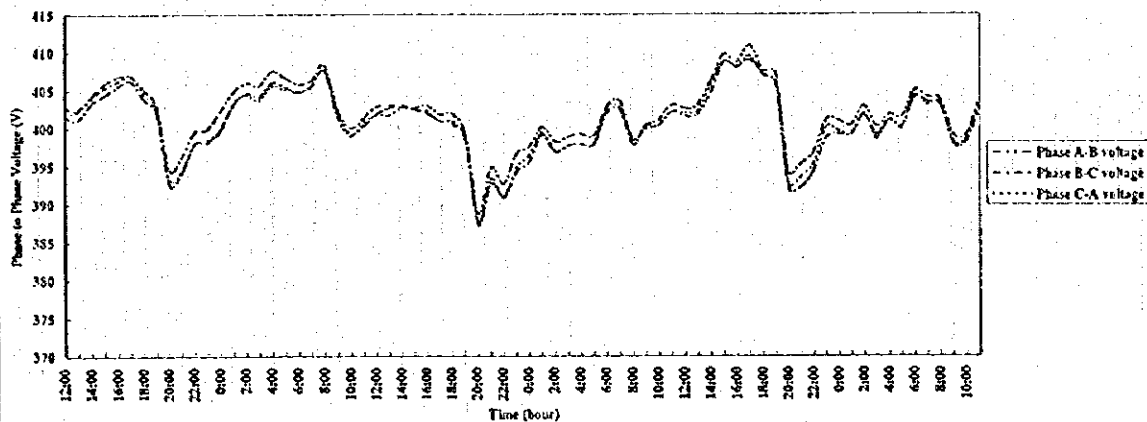
Results of measurement of power demand and power factor at Juhfia



Results of measurement of Phase current at Juhfia

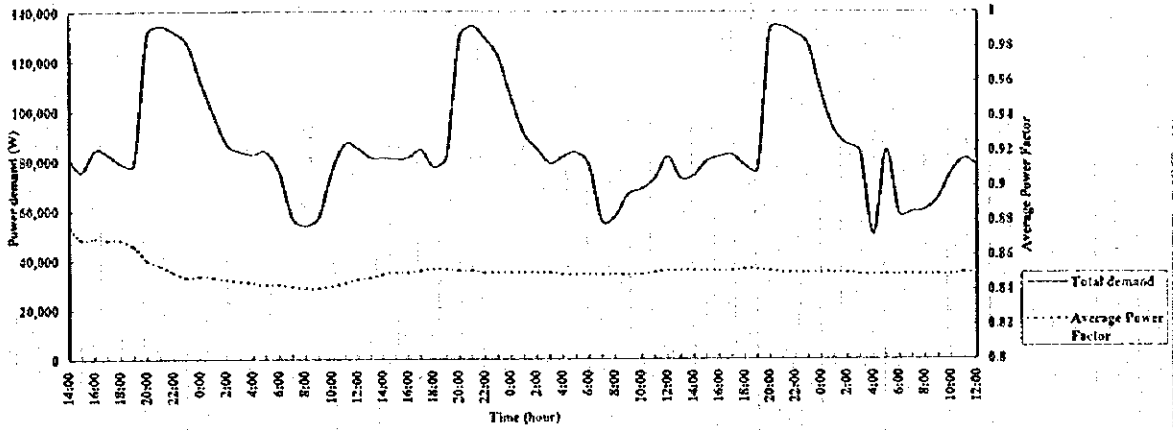


Results of measurement of line voltage at Juhfia

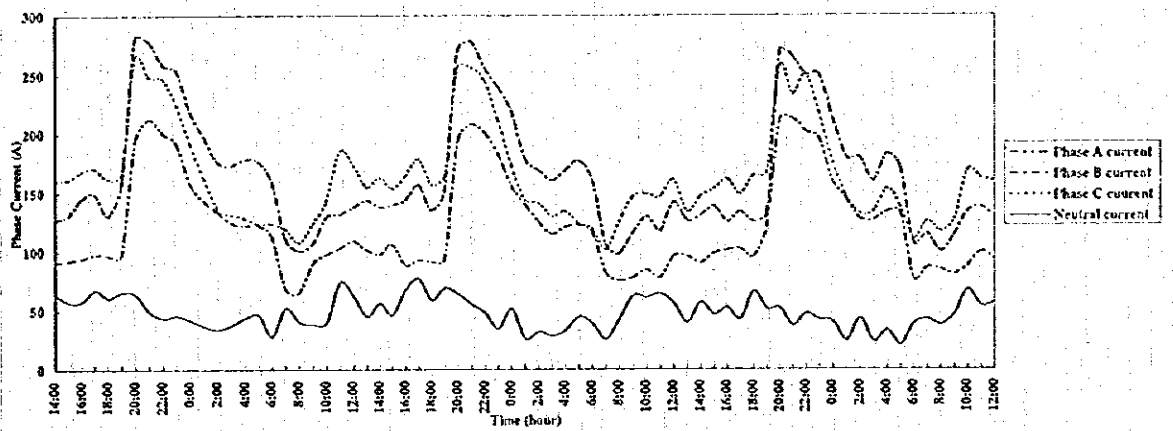


Appendix 4.2-7 Result of measurement at Al-Rafeed

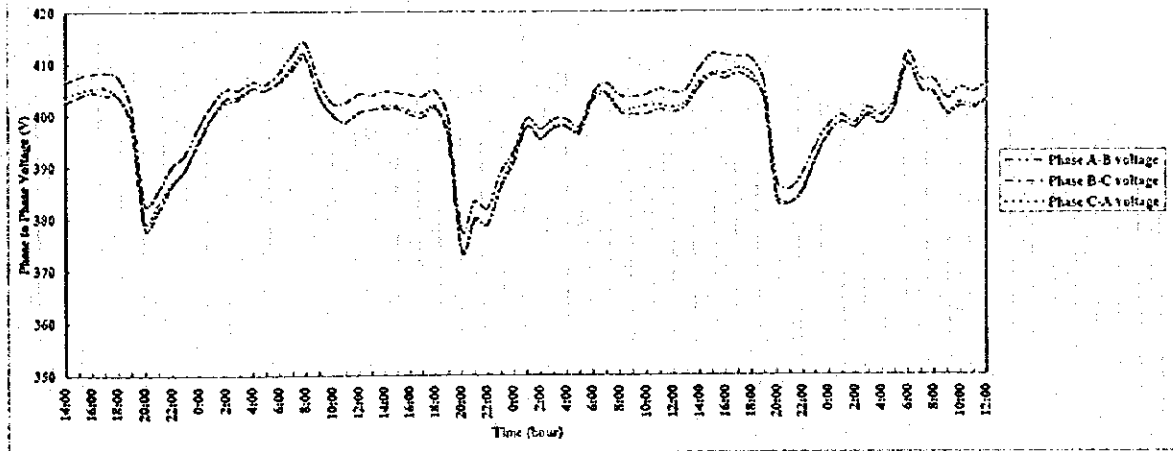
Results of measurement of power demand and power factor at Al-Rafeed



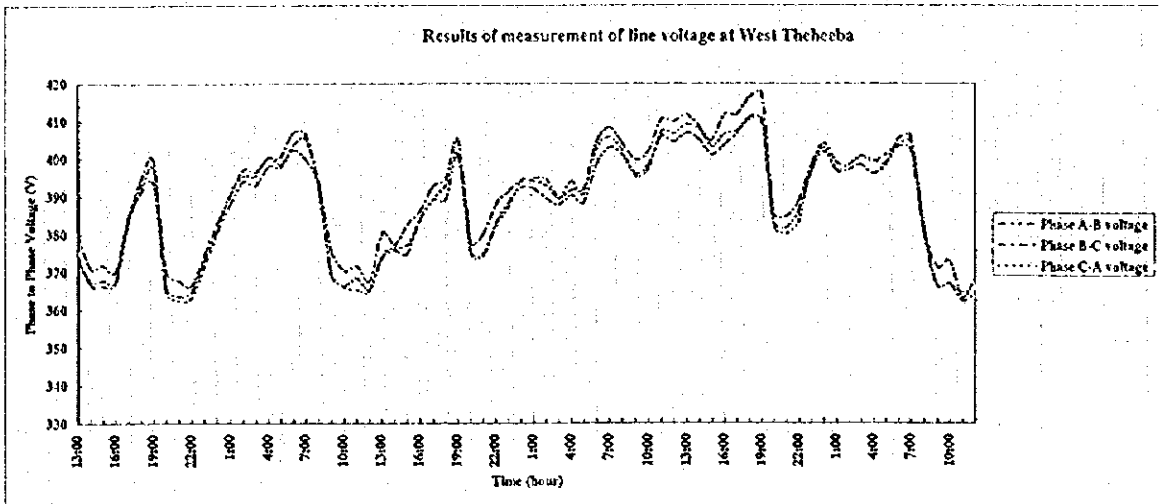
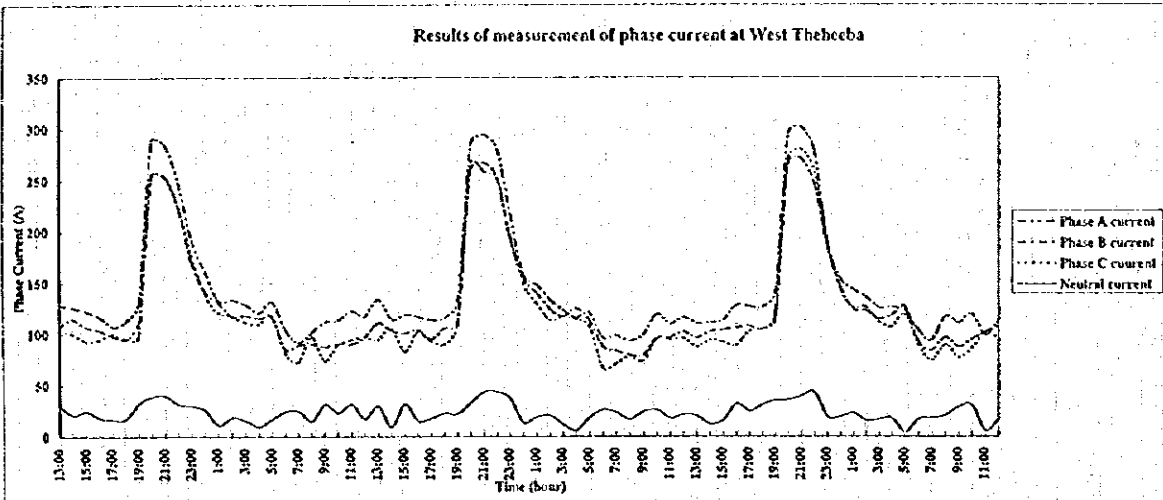
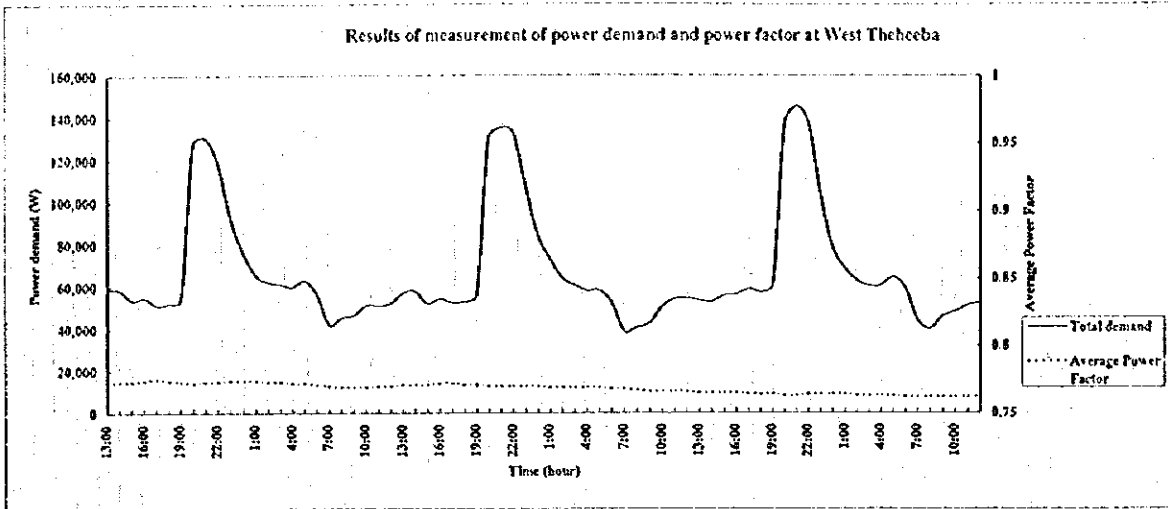
Results of measurement of phase current at Al-Rafeed



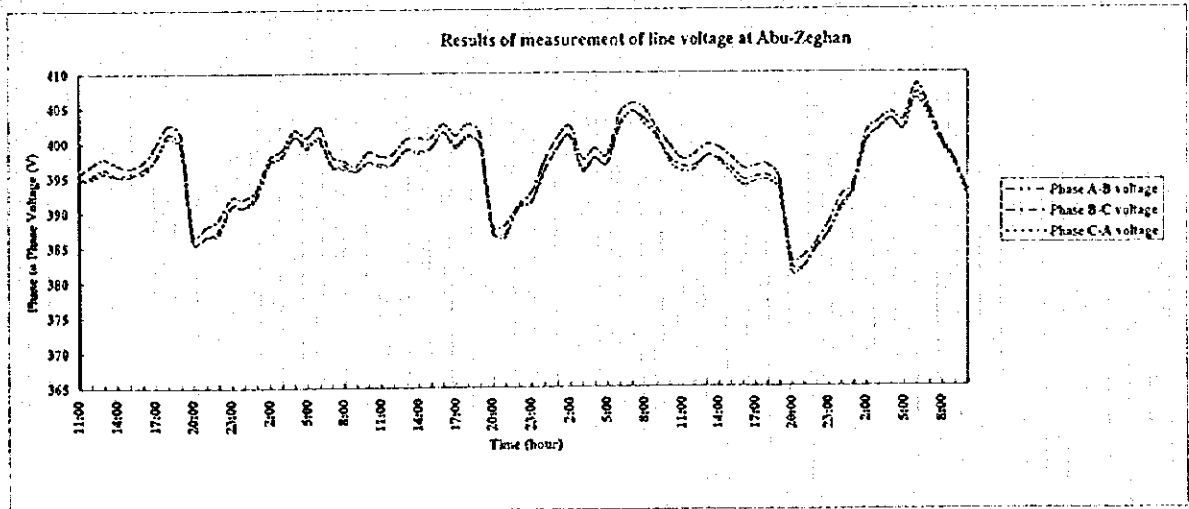
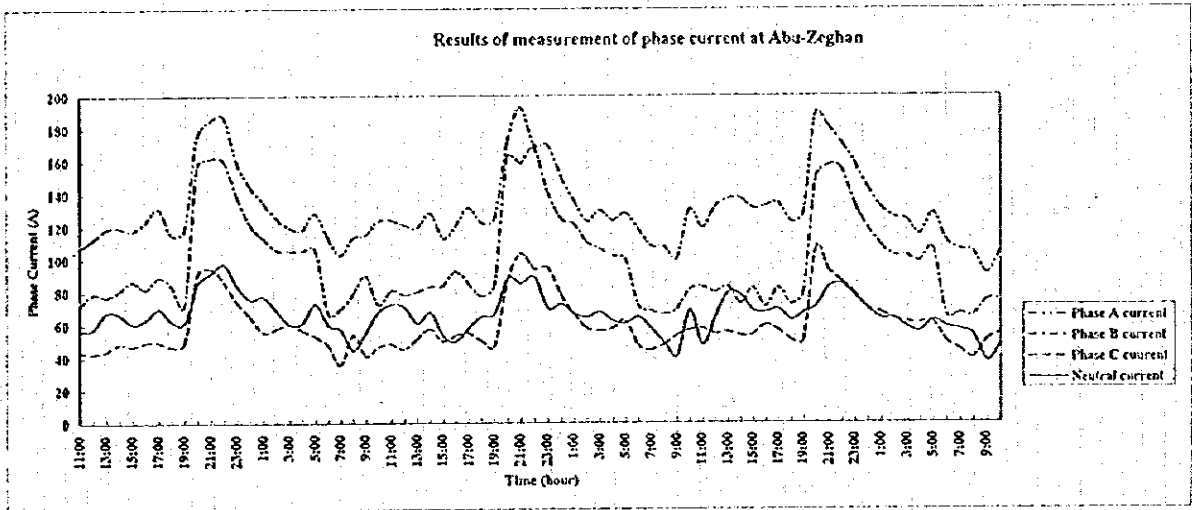
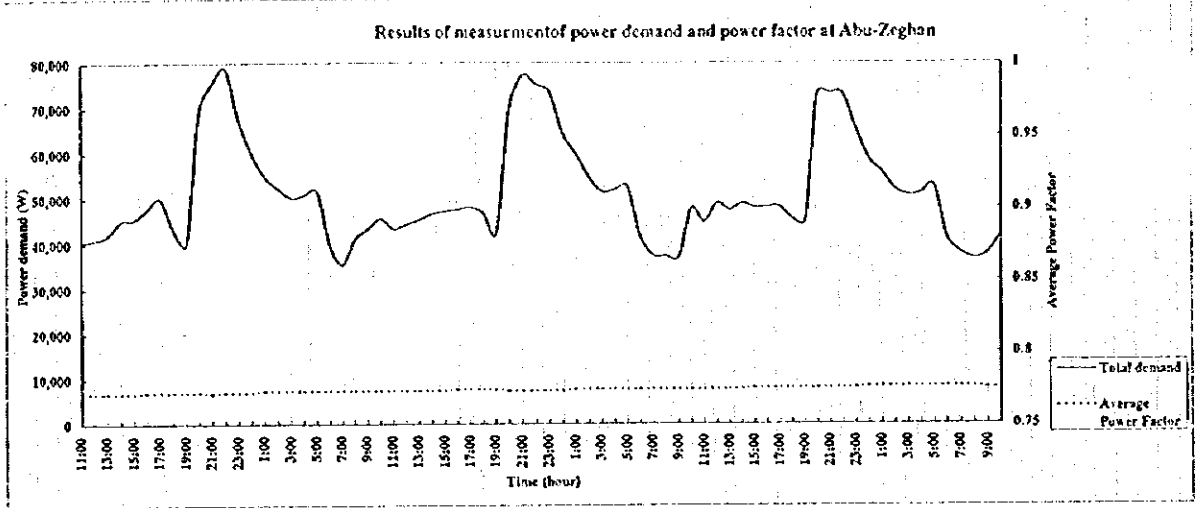
Results of measurement of line voltage at Al-Rafeed



Appendix 4.2-8 Result of measurement at West Theheeba



Appendix 4.2-9 Result of measurement at Abu-Zeghan



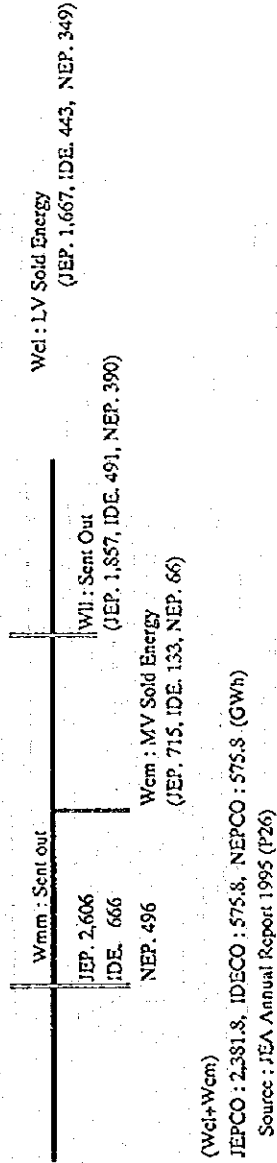
Appendix 4.4-1 Estimation of Distribution Loss

Applying Results of Measuring the Electrical Energy of Representative System

Company	Sent out energy		Estimated Sold Energy			Loss Energy			Loss Rate (%)	
	Wmm: MV (GWh)	Wtl: LV (GWh)	Wcm: MV (GWh)	Wcl: LV (GWh)	MV (GWh)	LV (GWh)	MV Part	LV Part	MV Part	LV Part
JEPKO	2,606	1,857	715	1,667	35	189			1.3	7.3
IDECO	666	491	133	443	42	47			6.4	7.1
NEPCO	496	390	66	349	40	41			8.02	8.32
Total	3,768	2,738	914	2,460	117	278			3.10	7.38

Note : Share Rate of MV Sold Energy Estimated From 1994 Data NEPCO Showed = $(676+352)/(602+4,074)=0.23$
 : Estimated Share Rate of MV sold Energy Based on Value above, NEPCO:0.23-alpha=0.16, JEPKO:0.23+alpha=0.3, IDECO:0.23

Wmm : JEPKO=Roundup(2,605.9)=2,606 IDECO=Roundup(653.8+12)=666 NEPCO=3,768-2,606-666=496
 Wtl : JEPKO=Roundup(1,857/(1-(0.16+0.044)/2))=1,857 IDECO=Roundup(443/(1-(0.133+0.06)/2))=491 NEPCO=Roundup(349/(1-0.1057))=390
 Wcm : JEPKO=Roundup(2,381.8*0.3)=715 IDECO=Roundup(575.8*0.23)=133 NEPCO=Roundup(414.6*0.16)=66
 Wcl : JEPKO=Roundup(2,381.8*0.7)=1,667 IDECO=Roundup(575.8*0.77)=443 NEPCO=3,373.914-1,667-443=349
 MV=Wmm-Wtl-Wcm, LV=Wtl-Wcl



Supplementary Description for Appendix 4.4-1

The electrical energy losses in the MV and LV systems have been calculated after estimating the following respective items.

(1) Estimation of electrical energy sold through MV and LV distribution systems

In consideration of the fact that 23% of electrical energy sent through all of the MV systems was sent to industrial plants and so forth as well as the approximate values presented by the Jordan counterparts and the regional characteristics of the respective power companies, the electrical energy sold through the MV and LV distribution systems has been estimated as shown in the table below:

Estimation of electrical energy sold through MV and LV distribution systems

	Electrical energy sold through MV system	Electrical energy sold through LV system
NEPCO	66 GWh (16%)	349 GWh (84%)
JEPCO	715 GWh (30%)	1,667 GWh (70%)
IDEO	133 GWh (23%)	443 GWh (77%)

(2) Estimation of electrical energy sent to the LV distribution systems

For estimating the electrical energy sent to the LV distribution systems, the electrical energy sold through the LV systems in Item (1) above was divided by the average loss factor obtained from the representative LV systems (Refer to Table 4.2-1).

Meanwhile, the loss factor presented in Table 4.1-2 was applied in the case of the NEPCO.