国際協力事業団

ジョルダン国
NEPCO

# ジョルダン国
# 送配電網電力損失低減計画調査

## 最終報告書

## 付　　録

平成9年5月



東電設計株式会社

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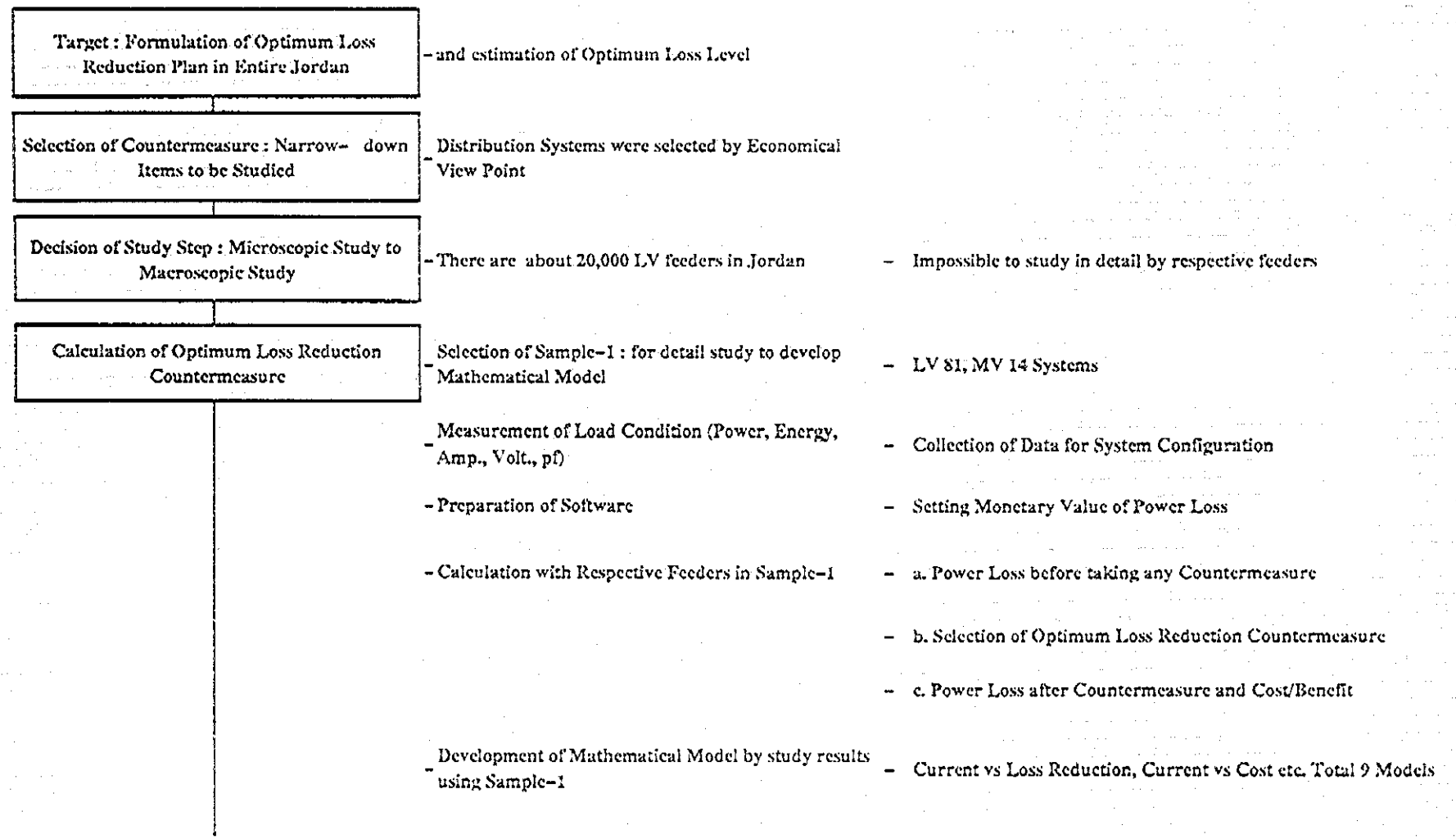
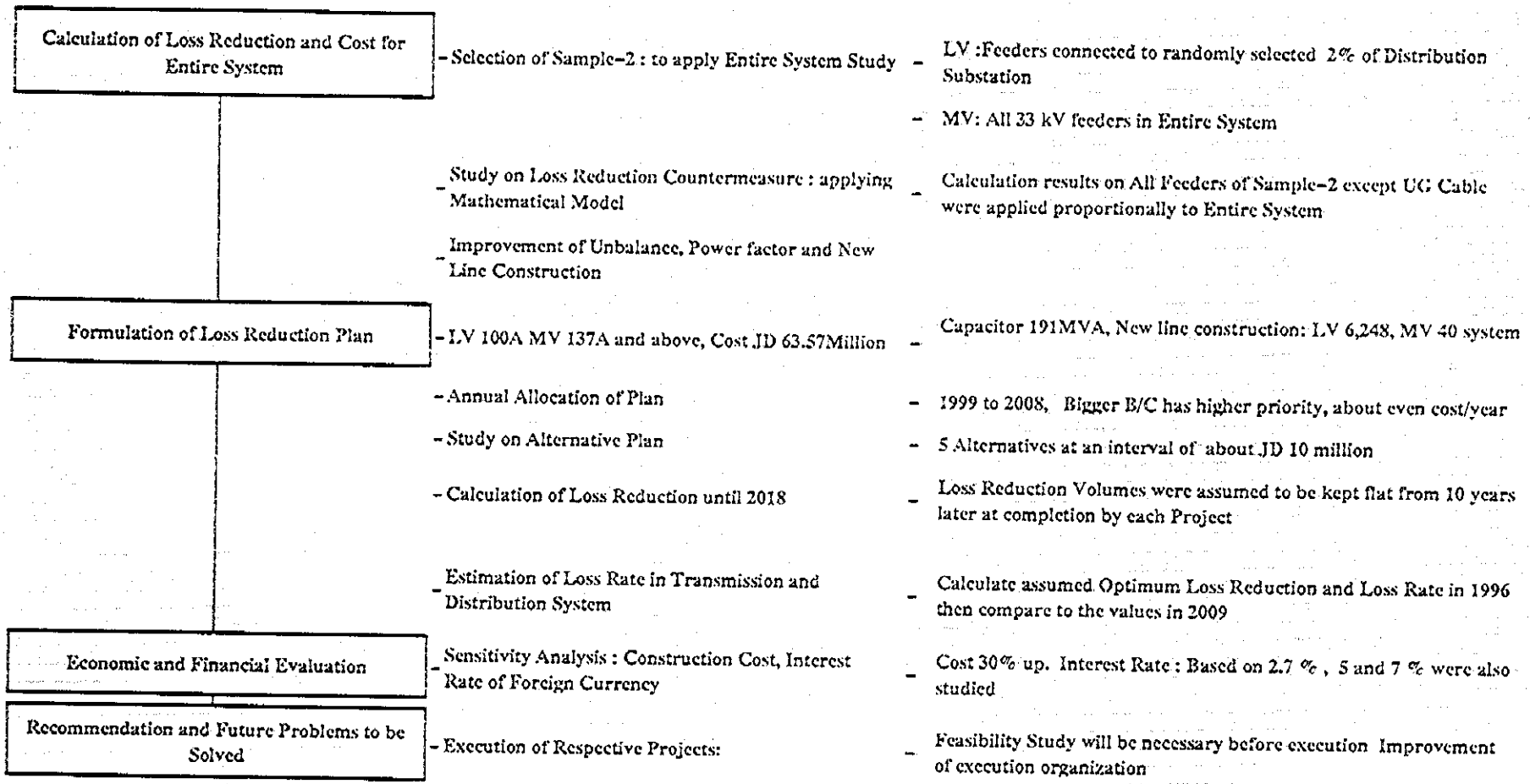
## APPENDICES

# 第１章

# 序　　論

## Appendix 1.1 Flow Chart for the Study on Power Loss Reduction of T. & D. Networks in Jordan

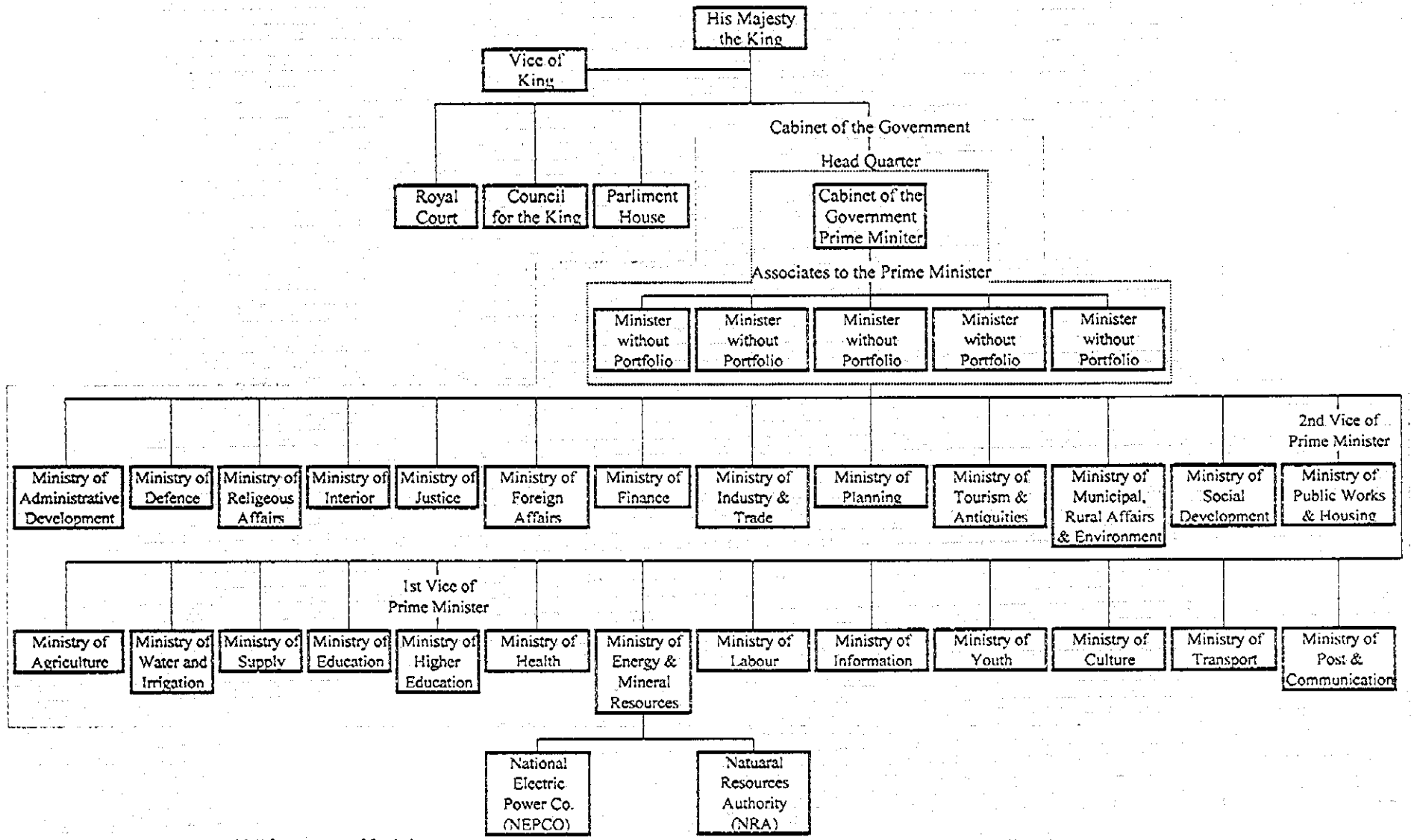



Calculation of Loss Reduction and Cost for Entire System
- Selection of Sample-2 : to apply Entire System Study
- LV :Feeders connected to randomly selected 2% of Distribution Substation
- MV: All 33 kV feeders in Entire System
- Study on Loss Reduction Countermeasure : applying Mathematical Model
- Calculation results on All Feeders of Sample-2 except UG Cable were applied proportionally to Entire System
- 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 6,248, MV 40 system
- Annual Allocation of Plan
- 1999 to 2008, Bigger B/C has higher priority, about even cost/year
- Study on Alternative Plan
- 5 Alternatives at an interval of about JD 10 million
- Calculation of Loss Reduction until 2018
- Loss Reduction Volumes were assumed to be kept flat from 10 years later at completion by each Project
- 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
Economic and Financial Evaluation
- 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

# 第２章

# ジョルダンの社会経済状況

## 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 (km2) | Population as of 1994 (persons) | Households as of 1994 (Nos.of HHs) | (Family size per HH) | Population density (persons/ k m2) |
|---|---|---|---|---|---|
| Amman Governorate | 8,231 | 1,574,809 | 279,701 | 5.63 | 191 |
| Amman City | | 713,993 | | | |
| Marqa | | 263,474 | | | |
| Qwasmeh | | 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 Abeed | | 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 |
| 1981 | 1,203.1 | 1,096.9 | 2,300.0 | & Housing |
| 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

(Million Jds.)

| No | Economic activity | At current prices: Gross Domestic Product (GDP) at current prices | | | | | Share rate (%) | Annual growth rate(%) | At constant prices: Gross Domestic Product (GDP) at 1985 current prices | | | | | Share rate (%) | Annual growth rate(%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 Housel | 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(*) | 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, teregrams 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 | 1,541.6 | 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 1994 (%) | 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% | |
| Vegitables | 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 Vegitable 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, fablics, made-up articles and related products | 19 | 12 | 15 | 19 | 21 | 2.11% | |
| Cemet | 22 | 26 | 22 | 17 | 27 | 2.72% | |
| Machinery and Transport Equipment | 14 | 7 | 12 | 24 | 39 | 3.92% | 29.19% |
| Miscelloneous 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% | 30.12% |
| 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 accesories | 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% | -40.54% |
| 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, vegitables 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 azad cork | 0 | 1 | 2 | 2 | 17 | 0.72% | |
| Textile, fablics 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 Vegitable Oil and Fats | 22 | 24 | 38 | 43 | 83 | 3.51% | 39.37% |
| Chemicals | 190 | 219 | 246 | 249 | 280 | 11.84% | 10.18% |
| Medical and pharmaceu. 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, fablics, made-up articles and related products | 71 | 77 | 94 | 95 | 88 | 3.72% | |
| Cemet | 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% | |
| Miscelloneous Manufactured Articles | 92 | 94 | 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

(1,000 tons)

| Kind of production | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | Growth rate (%) |
|---|---|---|---|---|---|---|---|---|
| 1. Plant Production | | | | | | | | |
| A. Field crops | | | | | | | | |
| Wheat | 78.8 | 54.5 | 82.9 | 61.8 | 75.4 | 57.1 | 46.9 | -12.17% |
| Barley | 44.9 | 20.6 | 42.4 | 39.9 | 68.9 | 31.8 | 27.4 | -11.62% |
| Tobacco | 3.7 | 2.9 | 2.9 | 1.3 | 3.2 | 3.4 | 1.5 | -20.21% |
| Lentils | 6.5 | 1.6 | 4.1 | 1.2 | 2.8 | 4.8 | 1.4 | -31.88% |
| B. Vegetables | | | | | | | | |
| Tomatoes | 218.7 | 250.4 | 376.9 | 275.5 | 490.3 | 331.5 | 438.7 | 19.01% |
| Eggplant | 72.9 | 43.8 | 59.5 | 61.1 | 49.4 | 33.6 | 37.9 | -15.09% |
| Cucumbers | 68.0 | 53.1 | 54.3 | 56.2 | 34.2 | 46.0 | 35.1 | -15.24% |
| Cauliflower and cabbages | 33.6 | 23.7 | 44.3 | 40.9 | 30.7 | 27.6 | 51.8 | 11.43% |
| Melons | 87.0 | 66.7 | 80.5 | 94.3 | 90.3 | 64.3 | 145.2 | 13.66% |
| C. Fruit trees | | | | | | | | |
| Olives | 70.8 | 25.7 | 63.7 | 40.6 | 81.8 | 31.8 | 94.1 | 7.37% |
| Grapes | 21.5 | 21.8 | 45.7 | 39.1 | 50.2 | 35.2 | 26.4 | 5.27% |
| Citrus fruits | 101.3 | 166.7 | 154.1 | 151.9 | 160.3 | 106.8 | 150.7 | 10.44% |
| Bananas | 33.3 | 13.4 | 18.9 | 26.3 | 11.5 | 30.3 | 24.7 | -7.20% |
| 2. Livestock Production | | | | | | | | |
| Red meat | 8.3 | 9.4 | 10.1 | 16.8 | 16.8 | 18.9 | 16.1 | 18.01% |
| Poultry meat | 68.0 | 43.0 | 50.0 | 60.0 | 70.0 | 83.4 | 94.0 | 8.43% |
| Milk | 66.4 | 69.4 | 96.4 | 156.7 | 156.7 | 166.6 | 151.4 | 22.88% |
| Eggs (mill. egg) | 380.0 | 350.0 | 530.0 | 710.0 | 775.0 | 862.2 | 871.0 | 23.04% |

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 1993

| Industrial origin | Number of employees | | | Number of enterprises | Gross value added (Domestic production) | Inter-mediate consum-tion | Gross output | Net indirect taxes | Depre-ciation | Operating surplus | Compen-sation of employees |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Female (Persons) | Male (Persons) | Total (Persons) | (Firms) | (1,000 JDs) | (1,000 JDs) | (1,000 JDs) | (1,000 JDs) | (1,000 JDs) | (1,000 JDs) | (1,000 JDs) |
| Mining and quarrying | 174 | 8,232 | 8,406 | 125 | 132,617 | 107,908 | 240,525 | 25,750 | 28,692 | 34,256 | 43,918 |
| Food manufacturing | 648 | 12,418 | 13,066 | 2,172 | 51,449 | 167,037 | 218,486 | 1,998 | 8,209 | 23,362 | 17,881 |
| Beverage industries | 113 | 1,200 | 1,313 | 23 | 34,454 | 18,129 | 52,583 | 18,276 | 1,222 | 11,435 | 3,520 |
| Tobacco manufacturing | 37 | 971 | 1,008 | 4 | 69,741 | 14,374 | 84,115 | 63,127 | 152 | 2,309 | 4,154 |
| Manufacture of textiles | 598 | 1,813 | 2,411 | 214 | 11,926 | 26,720 | 38,646 | 2,190 | 2,131 | 3,376 | 4,228 |
| Manufacture of wearing apparel except footwaer | 1,210 | 3,981 | 5,191 | 1,536 | 10,484 | 14,061 | 24,545 | 128 | 604 | 5,682 | 4,070 |
| Manufacture of leather and leather products | 27 | 326 | 353 | 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 | 291 | 4,952 | 6,809 | 11,761 | 30 | 509 | 2,646 | 1,766 |
| Furniture and wood products | 59 | 8,489 | 8,548 | 2,808 | 24,930 | 30,359 | 55,289 | 345 | 2,073 | 14,495 | 8,016 |
| Paper and paper products | 307 | 2,022 | 2,329 | 35 | 14,391 | 41,891 | 56,282 | 2,449 | 2,449 | 3,627 | 5,865 |
| Printing publishing and allied industries | 115 | 2,945 | 3,060 | 281 | 20,309 | 34,425 | 54,734 | 121 | 2,311 | 10,340 | 7,537 |
| Chemical and chemical products | 1,474 | 5,796 | 7,270 | 115 | 64,050 | 337,117 | 401,167 | 4,494 | 11,095 | 23,501 | 25,159 |
| Petroleum refineries | 71 | 3,773 | 3,844 | 1 | 34,297 | 340,049 | 374,346 | 4,901 | 4,391 | 5,484 | 19,520 |
| Manufacture of rubber products | 0 | 125 | 125 | 10 | 520 | 552 | 1,072 | 7 | 104 | 197 | 212 |
| Manufacture of plastic products (N.E.C) | 135 | 3,457 | 3,592 | 96 | 16,021 | 26,379 | 42,400 | 268 | 2,628 | 6,498 | 667 |
| Manufacture of non-metalic mineral products | 100 | 11,930 | 12,030 | 1,740 | 111,454 | 106,672 | 218,126 | 29,823 | 17,210 | 42,155 | 22,265 |
| Basic metal products | 16 | 1,361 | 1,377 | 25 | 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 | 2,299 | 23,645 | 45,002 | 68,647 | 743 | 2,754 | 12,609 | 7,539 |
| Machinery other than electrical | 45 | 1,649 | 1,694 | 63 | 8,567 | 19,582 | 28,149 | 853 | 770 | 4,256 | 2,689 |
| Manufacture of electrical machinery apparatus, appliances and supplies | 62 | 707 | 769 | 12 | 5,457 | 12,988 | 18,445 | 1,074 | 638 | 2,243 | 1,502 |
| Manufacture of transport equipment | 34 | 762 | 796 | 22 | 6,689 | 18,176 | 24,865 | 223 | 333 | 4,710 | 1,423 |
| Manufacture of professional scienstific, measuring and controlling equipment not (N.E.C | 51 | 94 | 145 | 2 | 896 | 789 | 1,685 | 19 | 233 | 249 | 394 |
| Other manufacturing industries | 10 | 147 | 157 | 38 | 268 | 126 | 394 | 22 | 119 | -2 | 129 |
| Electricity | 276 | 4,739 | 5,015 | 3 | 64,826 | 70,283 | 135,109 | 357 | 20,659 | 22,810 | 21,000 |
| Industrial services | 1 | 16,574 | 16,575 | 6,997 | 23,679 | 12,678 | 36,357 | 555 | 1,042 | 12,869 | 9,213 |
| Total | 5,747 | 102,599 | 108,346 | 18,980 | 766,817 | 1,523,475 | 2,290,292 | 168,193 | 112,611 | 261,845 | 218,201 |

Source : Statistical Year Book 1994, Department xof 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 Suvey**

| Economic activities of household head | Number of samples | | Persons per HHs | HHs size (persons/ HH) | Persons by economic activities (above 13 year) | |
|---|---|---|---|---|---|---|
| | Samples (HHs) | Share rate (%) | | | (persons) | Share(%) |
| 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** (JD/year/HH)

| Economic activities of household head | Income from employment | | | | | | | Total income from employ-ment | Own account workers | Property income | Other current transfer | Other receipts | Grand total of current income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In cash | | In kind | | | | | | | | | | |
| | Gross income | Net 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 hotel | 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 Jorda | 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/HH)

| | Expenditure item | Whole Jordan | | | Governorate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Rural | Urban | Jordan | Amman | Irbid | Zarqa | Balka | Mafrak | Karak | Ma'an | Tafiela |
| | Current income | 3,532 | 4,898 | 4,607 | 5,795 | 3,966 | 4,003 | 4,203 | 2,997 | 2,648 | 4,355 | 2,899 |
| Expenditure | 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 %/annun | | 0.80% | 0.83% | 0.81% | 5.15% | 5.15% | 5.15% |

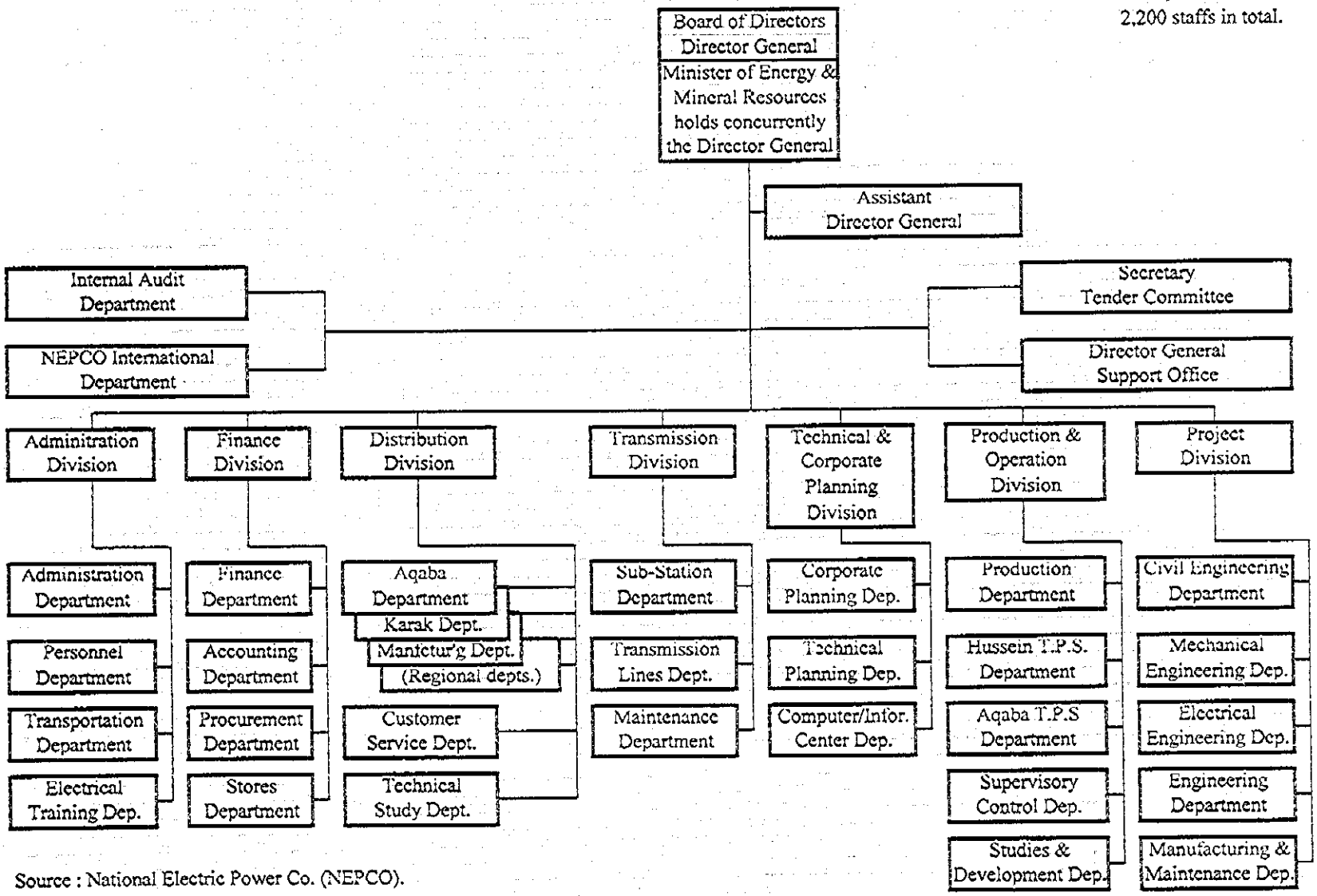
Source : Monthly Statistical Bulletin Vol.32 No.6, Central Bank of Jordan, June 1996.

# 第３章

# ジョルダンの電力事情

## 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)** (GWh)

| Name of power station | 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 | 2,184 | 11.14% |
| Aqaba Thermal | 1,463 | 1,352 | 1,641 | 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 Talal 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** (GWh)

| Energy consumption in Jordan and NEPCO sell to : | 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% |
| JEPCO | 1,572 | 1,664 | 1,920 | 2,152 | 2,397 | 2,606 | 10.64% |
| IDECO | 391 | 419 | 472 | 521 | 585 | 651 | 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% |
| Sheidiyah Phosphate Co. | 2 | 5 | 14 | 18 | 20 | 21 | 61.85% |
| Fertilizer Co. | 3 | 0 | 1 | 8 | 19 | 10 | 23.33% |
| Queens Alia Inter'l 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** (thousand)

| Energy consumption in Jordan and NEPCO sell to : | 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 | - |
| JEPCO | 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 |
| JEPCO'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

(JDs.)

| Debit | NEPCO in 1994 | NEPCO in 1995 | JEPCO in 1994 | IDECO in 1994 |
|---|---|---|---|---|
| Revenue from : | 121,489,052 | 134,541,212 | 86,821,457 | 21,252,652 |
| Electricity sales | 119,242,838 | 132,012,477 | 84,567,035 | 16,887,571 |
| Production poles | 1,404,900 | 1,477,673 | 0 | 0 |
| Other operating revenue | 841,314 | 1,051,062 | 2,254,422 | 967,081 |
| Government compensation due to equal tariff difference | 0 | 0 | 0 | 3,398,000 |
| Operating Expenses | 97,340,945 | 108,298,422 | 77,662,393 | 19,739,260 |
| 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 4) |
| Depreciation of fixed assets | 16,143,723 | 18,148,413 | 4,314,007 | 1,182,747 |
| Production cost - Pole plant | 1,042,108 | 1,193,471 | 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) | 0 |
| Currency rate differences depreciation | 0 | 0 | 824,672 | 0 |
| Fees and taxes | 0 | 0 | 5,522 | 0 |
| Reservve for doubtful loans | 0 | 0 | 0 | 20,000 |
| Balance | 0 | 0 | | |
| Operating profit | 24,148,107 | 26,242,790 | 9,159,064 | 1,513,392 |
| Investment incomes | 0 | 0 | 350,260 2) | 0 |
| Interest on loan and bank charges | -11,961,666 | -11,220,934 | -3,787,896 | -987,078 5) |
| Currency espenses 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) | 0 |
| 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 | 76,250 |
| Transfer from the optional reserve to close up the postponed loss of previous years | | 0 | 0 | 161,100 |
| Net profit (loss) for the year | 13,972,891 | 12,671,282 | 5,958,763 | 763,664 |
| Amount transfered to statutely reserve | -1,397,289 | -1,267,129 | | |
| Accumulated losses - beginning of the year | -28,920,718 | -16,345,116 | | |
| Accumulated losses - end of the year | -16,345,116 | -4,940,963 | | |
| Profit Distribution | - | - | - | |
| Optional or obligatory reserve | - | - | 595,876 | 52,631 |
| Provision for Jordanian University fees | - | - | 59,588 | 5,263 |
| Provision for scientific research and professional training support | - | - | 59,588 | 5,263 |
| Salary for the Board of Directors | - | - | 53,636 | 46,315 |
| Closing up board of directors salaries for 1993 | - | - | 0 | 19,083 |
| Income tax for previous year | - | - | 114,660 | 0 |
| Provision for income tax of the year | - | - | 2,222,510 | 0 |
| Profits suggested to be distributed | - | - | 1,620,000 | 0 |
| Profits to close up losses of previous years | - | - | 0 | 635,109 |
| Clos up part of the debts from the obligatory reserve | - | - | 1,232,905 | 0 |
| Total | - | - | 5,958,763 | 763,664 |

Source : Annual Report 1995 (JEA) (now named as NEPCO), The 57th Annual Report (JEPCO), 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)

| Credit | NEPCO in 1994 | NEPCO in 1995 | JEPCO in 1994 | IDECO in 1994 |
|---|---|---|---|---|
| Current Assets | 81,932,582 | 95,991,006 | 39,082,061 | 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 | |
| Debtor obligation and other debtor balance | | | | 7,305,150 |
| Storehouses by cost | | | | 3,138,369 |
| Investment in electrical industries | | | | 237,500 |
| Soareparts, fuel and materials | 27,923,325 | 33,844,827 | 11,905,858 | |
| Interest receivable on Loans | 507,361 | 602,018 | | |
| Loan installments due | 564,516 | 503,090 | | |
| Current portion of long-term loans receivable | 693,190 | 551,673 | | |
| Deposits on documentary credits | 1,030,952 | 811,363 | 737,742 | |
| Prepaid expenses and other debit balances | 382,471 | 361,256 | 69,270 | |
| Other Assets | 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 | 240,129,113 | 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 | 9507233 | 4,607,537 | 2,164,951 |
| Net book value of assets contributed by consumers | 21,522,198 | 22,055,737 | 18,660,102 | 9,106,526 |
| Rural fils fund assets | 522,916 | 522,916 | 1,521,041 | 2,920,055 |
| Less : Accumuleted depreciation | 209,166 | 230,083 | 300,345 | 319,599 |
| Net book value of rural fils fund asset | 313,750 | 292,833 | 1,220,696 | 2,600,456 |
| Total net book value of total fixed ass | 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 |
| Total Assets | 373,304,255 | 421,180,197 | 134,803,748 | 43,815,593 |

| Debit | NEPCO in 1994 | NEPCO in 1995 | JEPCO in 1994 | IDECO in 1994 |
|---|---|---|---|---|
| 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 1) | |
| Accounts payable | 21,853,025 | 42,754,654 | 26,892,715 2) | 3,063,813 |
| Other creditor balance | | | 5,835,396 | 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 | | 5,441,551 3) |
| Loan installments 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 | 192,886,348 | | 25,009,468 |
| Loans and bonds | 202,982,604 | 209,319,390 | | 5,456,427 |
| Counry-side fils deposits | | | | 2,600,456 |
| Loans to finance fixed assets under capital lease | 7,044,620 | 9,354,803 | | |
| Less : Current portion of loans and bonds | 24,834,947 | 27,064,832 | | |
| Long-term loans and bonds | 185,192,277 | 191,609,361 | | 7,846,049 |
| Consumers' deposits | 1,169,091 | 1,276,987 | | 9,106,526 |
| Equity | 115,470,630 | 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 | | | 3,000,000 | |
| Statutory reserve/obligatory reserve | 4,834,703 | 6,101,832 | 5,469,154 | 1,150,061 |
| Optional reserve | | | 188,243 | 6,099 |
| 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 | 1,521,041 | |
| Accumulated losses | -16,345,116 | -4,940,963 | -300,345 | |
| Net equity of the Government of Jordan | 93,634,682 | 107,549,185 | 1,220,696 | |
| Consumers' contributions - Net amortization | 21,522,198 | 22,055,737 | | |
| Long-term loans | | | 26,053,396 | |
| 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 (JEPCO), and The 33rd Annual Report )IDECO).

Note 1. Subscribers insurance.
2. Creditor obligations.
3. Including loan installments.

## 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 | CCT OLD | CCT NOW | CAPACITY | ID. | TAP REAL | TAP IMAG. F/T | PHASE MODIFIER C | PHASE MODIFIER 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 | 1.0600 | 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 | AXM.S | 1.0000 | 0.0000 | F | |
| 38 | 43 | 44 | | 0.0000 | 16.2500 | 0.0000 | 0 | 0 | 0.0 | AQA8.TK.A2 | 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 | CCT OLD | CCT NOW | CAPACITY | ID. | TAP REAL | TAP IMAG. | TAP F/T | PHASE MODIFIER C | PHASE MODIFIER 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 | ATPS | 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 | QUWIERA | 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 | SUBEIHI | 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 | QATRAN | 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 | CCT OLD | CCT NOW | CAPACITY | ID. | TAP REAL | TAP IMAG. | F/T | PHASE MODIFIER C | PHASE MODIFIER R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 107 | 66 | 6 | 0.0000 | 23.0000 | 0.0000 | 0 | 0 | 0.0 | REH-GN | 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 | AZZRAQ | 1.0000 | 0.0000 | F | | |
| 213 | 59 | 60 | 0.0000 | 95.0000 | 0.0000 | 0 | 0 | 0.0 | AZZRAQ | 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 | KARAK | 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 | SABHA | 1.0000 | 0.0000 | T | | |
| 221 | 771 | 0.0000 | 95.2000 | 0.0000 | 0 | 0 | 0.0 | SAFAWI | 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 | SEED | 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 | RUWASH | 1.0000 | 0.0000 | F | | |

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

* NODE DATA *

| CODE | B-KV | EXS | 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 |
| 5 | 0 | 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 |
| 9 | 0 | 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 |
| 15 | 0 | 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 |
| 21 | 0 | 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 |
| 23 | 0 | 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 |
| 27 | 0 | 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 |
| 31 | 0 | 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 |
| 35 | 0 | 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 |
| 39 | 0 | 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 |
| 43 | 0 | 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 |
| 338 | 0 | 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 |
| 61 | 0 | 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 |
| 666 | 0 | 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 |
| 333 | 0 | 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 |
| 44 | 0 | 0.0000 | 0.0000 | 0.0000 | 20.0000 | 12.0000 | 0.0000 | | 0.0000 | 0.0000 |
| 442 | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 |
| 2230 | 0 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 |
| 22 | 0 | 0.0000 | 0.0000 | 0.0000 | 46.0000 | 28.7000 | 0.0000 | | 0.0000 | 0.0000 |
| 2220 | 0 | 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 |
| 10 | 0 | 0.0000 | 0.0000 | 0.0000 | 82.0000 | 51.1000 | 0.0000 | | 0.0000 | 0.0000 |
| 992 | 0 | 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 |
| 994 | 0 | 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 |
| 1002 | 0 | 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 |
| 801 | 0 | 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 |
| 995 | 0 | 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 |
| 30 | 0 | 0.0000 | 0.0000 | 0.0000 | 21.5000 | 13.0000 | 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 |
| 440 | 11 | 105.0000 | 10.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | AQABA11K | 0.0000 | 0.0000 |

* NODE DATA *

| CODE | B-KV | EKS | PG | QG | PL | QL | C/R | ID | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 141 | 15 | 105.0000 | 130.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | AQABA15K | 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 | GBORSAF3 | 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 | AMMSGT2 | 0.0000 | 0.0000 |
| 222 | 11 | 100.9700 | 30.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | AMMSGT1 | 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 | RESHAB | 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 | FGHISEL | 0.0000 | 0.0000 |
| 111 | 13 | 103.0000 | 24.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | HTPS13.8 | 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 | HTPSGN3 | 0.0000 | 0.0000 |
| 1114 | 13 | 103.0000 | 56.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | HTPSGN4 | 0.0000 | 0.0000 |
| 1115 | 103.0000 | 56.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | HTPSGN5 | 0.0000 | 0.0000 | |
| 1116 | 13 | 103.0000 | 56.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | HTPSGN6 | 0.0000 | 0.0000 |
| 1117 | 13 | 103.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | HTPSGN7 | 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 | ZARQA10K | 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 | REH-GEN | 0.0000 | 0.0000 |
| 660 | 11 | 0.0000 | 0.0000 | 31.6000 | 0.0000 | 0.0000 | 0.0000 | NEWREH | 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       EKS        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=JRDPWF  ;  OLDN=JRDPWF  ;  REPLACED. ***
```

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

## (Power Flow Data)



```
0001 &&CALC   DATA=BASE  SW1=1117   NAME=JRDPWF  OLDN=JRDPWF   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
```

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

JORDAN POWER FLOW NET

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

*** POWER FLOW ***

| | | VOLTAGE | | | GENERATOR | | LOAD | | |
|---|---|---|---|---|---|---|---|---|---|
| NODE | CODE | E(KV) | \|E\|(%) | ANGLE | P(%) | Q(%) | P(%) | Q(%) | C/R(%) |
| | 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 | | |
| | 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 | |
| | 666 | 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 SET

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

*** POWER FLOW ***

| | | | VOLTAGE | | GENERATOR | | LOAD | | |
|---|---|---|---|---|---|---|---|---|---|
| NODE | CODE | B(KV) | \|E\|(%) | ANGLE | P(%) | Q(%) | P(%) | Q(%) | C/R(%) |
| | 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 | |
| GHORSAF3 | 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 | |
| AMMSGT2 | 223 | 11.107 | 100.970 | 0.089 | 30.000 | 3.681 | 0.000 | 0.000 | |
| AMMSGT1 | 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 | |
| RESBAH | 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 | -7.271 | 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 | |
| HTPSGN3 | 1113 | 13.390 | 103.000 | -0.106 | 24.000 | 15.656 | 0.000 | 0.000 | |
| HTPSGN4 | 1114 | 13.390 | 103.000 | 0.078 | 56.000 | 35.263 | 0.000 | 0.000 | |
| HTPSGN5 | 1115 | 13.390 | 103.000 | 0.078 | 56.000 | 35.263 | 0.000 | 0.000 | |
| HTPSGN6 | 1116 | 13.390 | 103.000 | 0.078 | 56.000 | 35.263 | 0.000 | 0.000 | |
| HTPSGN7 | 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 | 24.000 | 14.500 | |
| ZARQA10K | 122 | 10.500 | 105.000 | -2.146 | 12.000 | 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 | 98.950 | -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 | |
| REH-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 ***

| | | VOLTAGE | | | GENERATOR | | LOAD | | |
|---|---|---|---|---|---|---|---|---|---|
| NODE | CODE | E(KV) | \|E\|(%) | ANGLE | P(%) | Q(%) | P(%) | Q(%) | C/R(%) |
| | 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 | 2.615 | 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 | | | | 896.062 | 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 ===> (PU) | LOSS-P (%) | LOSS-Q (%) | CHARGE (%) | <=== P (%) | <=== Q (%) | <=== I (PU) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 5 | 81.561 | -3.885 | 0.7911 | 0.325 | -1.236 | -2.995 | -81.236 | 2.649 | 0.7899 |
| 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..000 | 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 | 0.7373 | 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 | -4.092 | -55.500 | -34.351 | 0.6595 |
| 16 | 21 | 25 | 9.852 | -0.956 | 0.0982 | 0.004 | -2.132 | -2.156 | -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 ===> (PU) | LOSS-P (%) | LOSS-Q (%) | CHARGE (%) | <=== P (%) | <=== Q (%) | <=== I (PU) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.906 | -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. | 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 | -9.095 | 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 | 0.448 | -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 ===> (PU) | LOSS-P (%) | LOSS-Q (%) | CHARGE (%) | <=== P (%) | <=== Q (%) | <=== I (PU) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 0.1018 |
| 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 NOMIN= 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 | total | Send out | Power factor |
|---|---|---|---|---|---|---|
| | MW | MVar | MVar | MVar | pf (%) | of Transformer |
| 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 |

# 第４章

# 電力損失の現状

## Appendix 4.2-1 Measured data of feeder at Juhfia

| 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 |
| 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 | 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 |
| 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 | 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 |
| 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 | (W) | Phase A | Phase B | Phase C | Average |
| 14:00 | 90.8 | 127 | 160.3 | 63.51 | 406.4 | 402.5 | 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 | 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 | 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 | 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 | 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 | 78,490 | 0.867 | 0.865 | 0.864 | 0.865 |
| 20:00 | 194.6 | 281 | 265 | 63.6 | 382.9 | 378.3 | 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 | 134,100 | 0.852 | 0.858 | 0.85 | 0.854 |
| 22:00 | 200 | 258 | 246 | 43.5 | 390.1 | 386.3 | 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 | 127,000 | 0.847 | 0.855 | 0.844 | 0.847 |
| 0:00 | 157 | 218 | 190.7 | 41.6 | 397.7 | 394.7 | 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 | 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 | 86,700 | 0.846 | 0.854 | 0.838 | 0.846 |
| 3:00 | 124.2 | 172.9 | 130.8 | 37.33 | 404.9 | 403.6 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 81,170 | 0.854 | 0.853 | 0.843 | 0.85 |

| 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 |
| 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 | 161.3 | 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 | 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 |
| 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 | 0.853 | 0.843 | 0.85 |

## Appendix 4.2-3 Measured data of feeder at West Theheeba

| 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 |
| 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 | 125.2 | 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 | 106.9 | 92.9 | 24.65 | 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 | 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 |
| 16:00 | 116.8 | 104.1 | 102 | 15.64 | 384.1 | 386.1 | 383.6 | 54,150 | 0.794 | 0.758 | 0.763 | 0.772 |
| 17:00 | 113.8 | 94.7 | 93.4 | 17.59 | 389 | 392.7 | 389.1 | 52,470 | 0.794 | 0.757 | 0.763 | 0.772 |
| 18:00 | 115.5 | 105.9 | 89.6 | 22.74 | 389.1 | 394.6 | 392.9 | 52,950 | 0.794 | 0.757 | 0.763 | 0.771 |
| 19:00 | 131.1 | 109.1 | 107 | 22.07 | 400.3 | 404.7 | 400.9 | 55,830 | 0.793 | 0.756 | 0.762 | 0.771 |
| 20:00 | 286 | 260 | 267 | 32.9 | 375 | 377.6 | 374.3 | 130,400 | 0.792 | 0.756 | 0.761 | 0.77 |
| 21:00 | 294 | 267 | 258 | 43.7 | 374.7 | 380 | 374 | 135,300 | 0.792 | 0.756 | 0.76 | 0.77 |
| 22:00 | 280 | 253 | 252 | 43.5 | 382.8 | 387.7 | 382 | 133,300 | 0.792 | 0.756 | 0.76 | 0.77 |
| 23:00 | 217 | 194.3 | 192.9 | 37.5 | 388.1 | 391.2 | 386.9 | 108,600 | 0.792 | 0.756 | 0.759 | 0.77 |
| 0:00 | 158.5 | 155 | 149 | 13.87 | 392.2 | 394.2 | 393.6 | 84,490 | 0.792 | 0.757 | 0.758 | 0.77 |
| 1:00 | 147.6 | 139.7 | 129.1 | 19.19 | 392 | 394.7 | 394 | 73,410 | 0.792 | 0.757 | 0.758 | 0.769 |
| 2:00 | 133.7 | 124.2 | 113.8 | 20.59 | 389.5 | 394.5 | 392.8 | 64,120 | 0.792 | 0.757 | 0.758 | 0.769 |
| 3:00 | 123.3 | 117.3 | 116.3 | 11.63 | 387.7 | 389.5 | 389.3 | 60,630 | 0.792 | 0.757 | 0.757 | 0.769 |
| 4:00 | 115.8 | 124.5 | 114.3 | 5.83 | 390.3 | 391.6 | 393.8 | 58,240 | 0.792 | 0.757 | 0.757 | 0.769 |
| 5:00 | 120.3 | 112.8 | 107.4 | 18.21 | 388.3 | 392 | 390.6 | 58,130 | 0.791 | 0.757 | 0.756 | 0.769 |
| 6:00 | 96.2 | 88.3 | 66.9 | 25.89 | 398.2 | 404.3 | 402.2 | 52,560 | 0.791 | 0.757 | 0.756 | 0.768 |
| 7:00 | 98.2 | 83.3 | 70.4 | 23.62 | 402.9 | 408.3 | 405.7 | 38,910 | 0.79 | 0.756 | 0.755 | 0.768 |
| 8:00 | 93.2 | 79.8 | 78.3 | 16.86 | 401.2 | 404.2 | 402.2 | 40,670 | 0.79 | 0.756 | 0.755 | 0.767 |
| 9:00 | 99 | 79.2 | 73.4 | 24.15 | 396 | 399.8 | 395.4 | 42,750 | 0.789 | 0.755 | 0.754 | 0.766 |
| 10:00 | 118.9 | 95.5 | 95 | 25.98 | 398.3 | 401.8 | 397.2 | 50,630 | 0.788 | 0.755 | 0.754 | 0.766 |
| 11:00 | 109.6 | 96.6 | 94.2 | 17.98 | 405.8 | 410.2 | 407 | 54,190 | 0.788 | 0.755 | 0.753 | 0.766 |
| 12:00 | 116 | 101.9 | 95.5 | 21.61 | 404.4 | 409.9 | 406.6 | 54,560 | 0.788 | 0.755 | 0.753 | 0.766 |
| 13:00 | 110.2 | 96.3 | 87.5 | 20.05 | 406.9 | 411.7 | 409 | 53,500 | 0.787 | 0.755 | 0.753 | 0.765 |
| 14:00 | 111.1 | 102.1 | 93.9 | 11.99 | 405.1 | 408.4 | 407.6 | 52,880 | 0.787 | 0.754 | 0.752 | 0.765 |
| 15:00 | 113.2 | 103.9 | 92.1 | 15.7 | 401 | 404.8 | 403.2 | 55,830 | 0.787 | 0.754 | 0.752 | 0.765 |
| 16:00 | 127.5 | 105.9 | 88.8 | 31.8 | 403.6 | 411.6 | 406.5 | 56,470 | 0.787 | 0.754 | 0.752 | 0.765 |
| 17:00 | 126.7 | 107.5 | 102.5 | 24.88 | 406.8 | 411.8 | 407.4 | 58,750 | 0.786 | 0.754 | 0.752 | 0.764 |
| 18:00 | 126.2 | 104.3 | 104.8 | 30.79 | 411 | 416.3 | 410.2 | 57,550 | 0.786 | 0.753 | 0.751 | 0.764 |
| 19:00 | 139.2 | 117 | 112 | 35.3 | 410.3 | 417.2 | 410.4 | 60,520 | 0.786 | 0.753 | 0.75 | 0.764 |
| 20:00 | 296 | 268 | 272 | 35.8 | 382.8 | 385.2 | 381.7 | 137,400 | 0.786 | 0.753 | 0.749 | 0.763 |
| 21:00 | 302 | 271 | 280 | 39.5 | 381.7 | 384.7 | 380.1 | 145,700 | 0.786 | 0.753 | 0.749 | 0.763 |
| 22:00 | 278 | 246 | 258 | 43.4 | 386.3 | 388.8 | 383.4 | 137,800 | 0.786 | 0.753 | 0.749 | 0.764 |

| 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 |
| 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) | | | | 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 |
| 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 |

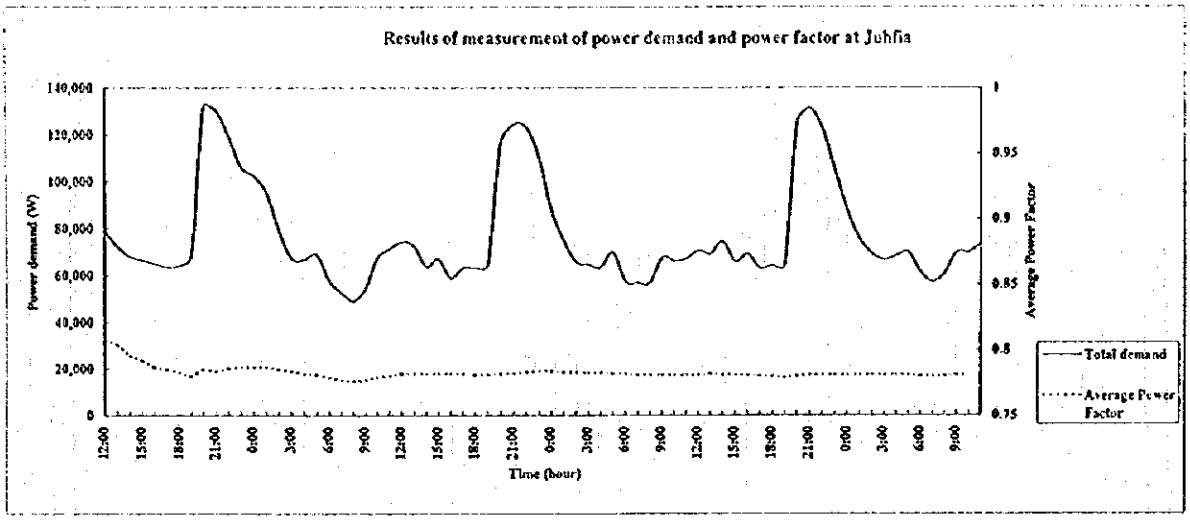
| Time | Current (Ampere) | | | | Line voltage (V) | | | Total demand | Power factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phase A | Phase B | Phase C | Neutral | Phase A-B | Phase B-C | Phase C-A | (W) | Phase A | Phase B | Phase C | Average |
| 14:00 | 128.3 | 83.3 | 57.4 | 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 |

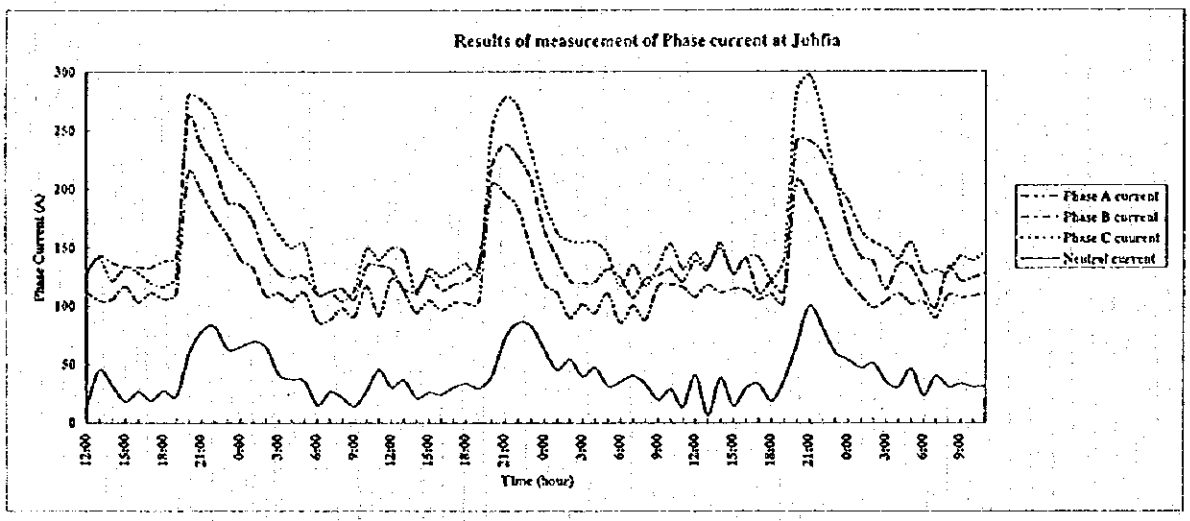
| Time | Current (Ampere) | | | | Line voltage (V) | | | Total demand | Power factor | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phase A | Phase B | Phase C | Neutral | Phase A-B | Phase B-C | Phase C-A | (W) | Phase A | Phase B | Phase C | Average |
| 21:00 | 180.7 | 157.4 | 93 | 83.12 | 382 | 383.5 | 382 | 73,330 | 0.787 | 0.773 | 0.761 | 0.775 |
| 22:00 | 170.3 | 154.9 | 86.4 | 84.27 | 384.7 | 385.6 | 384.8 | 73,010 | 0.787 | 0.773 | 0.761 | 0.775 |
| 23:00 | 158.3 | 133.6 | 78.8 | 77.29 | 386.8 | 388.2 | 386.8 | 65,210 | 0.787 | 0.773 | 0.761 | 0.775 |
| 0:00 | 143.5 | 118.9 | 69 | 70.11 | 390.7 | 392 | 390.1 | 58,710 | 0.787 | 0.774 | 0.761 | 0.776 |
| 1:00 | 131.6 | 108.1 | 67.2 | 63.59 | 393.2 | 394 | 392.9 | 55,800 | 0.787 | 0.774 | 0.761 | 0.776 |
| 2:00 | 125.8 | 102.4 | 63.3 | 63.9 | 399.8 | 401.1 | 399.8 | 52,010 | 0.787 | 0.775 | 0.76 | 0.776 |
| 3:00 | 123.7 | 101.9 | 61.2 | 58.2 | 401.8 | 402.9 | 401.7 | 50,750 | 0.787 | 0.775 | 0.761 | 0.776 |
| 4:00 | 115 | 98.6 | 60.9 | 55.99 | 403.3 | 404.2 | 403.2 | 51,160 | 0.787 | 0.775 | 0.76 | 0.776 |
| 5:00 | 127.8 | 105.9 | 61.2 | 62.4 | 401.9 | 403.2 | 401.9 | 52,780 | 0.787 | 0.775 | 0.761 | 0.776 |
| 6:00 | 110.9 | 65.5 | 49.5 | 58.45 | 407 | 408.2 | 406.2 | 41,210 | 0.787 | 0.775 | 0.76 | 0.776 |
| 7:00 | 105.8 | 66.7 | 44.5 | 56.87 | 404.1 | 404.9 | 403.3 | 38,010 | 0.786 | 0.775 | 0.76 | 0.776 |
| 8:00 | 104 | 65.4 | 39.53 | 53.14 | 399.8 | 400.6 | 399.6 | 36,710 | 0.786 | 0.775 | 0.76 | 0.776 |
| 9:00 | 91 | 74.8 | 50.2 | 37.41 | 397.1 | 397.4 | 396.5 | 37,760 | 0.786 | 0.775 | 0.759 | 0.775 |
| 10:00 | 104.7 | 75.3 | 54.5 | 47.4 | 392.5 | 392.9 | 391.9 | 41,940 | 0.786 | 0.775 | 0.759 | 0.775 |

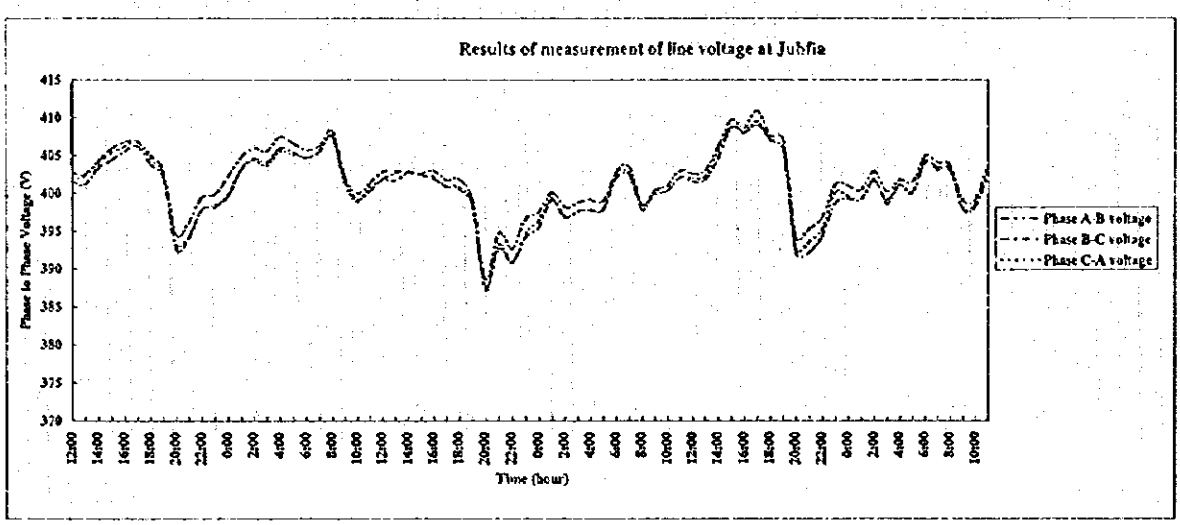
## Appendix 4.2-5 Results of measurement in service wire and calculation of energy loss per energy load

| Substation name | Service wire | | | | Loss factor | Energy loss (Wh) | Voltage to ground (V) | Power factor | Load factor in the year | Energy load (Wh) | | average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Current (Ampere) | Length (meter) | Conductor size (mm2 *number) | Resistance (Ohm) | | | | | | | | |
| | a | | | b | c | d=a^2*b*c*8760 | e | f | g | h=a*e*f*g*8760 | d/h | |
| Juhfia | 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 | 0.105061 | 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 | 0.00051 | |
| | 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 | 5,307,067 | 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 | 1,880.5 | 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 | 25 | 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 | 25 | 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 | 18,805.3 | 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 |

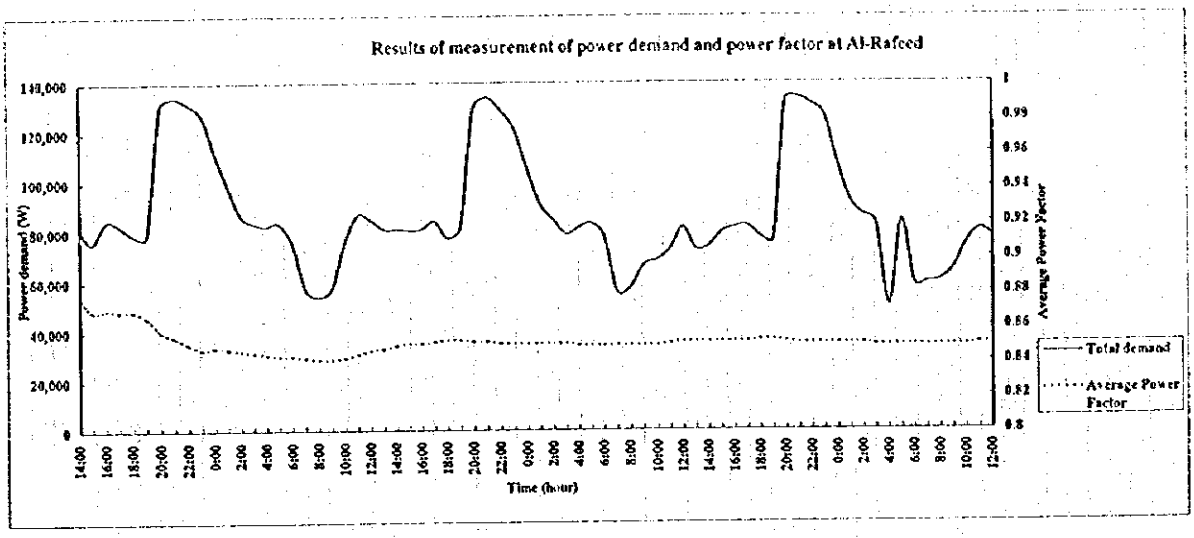
# Appendix 4.2-6 Result of measurement at Juhfia

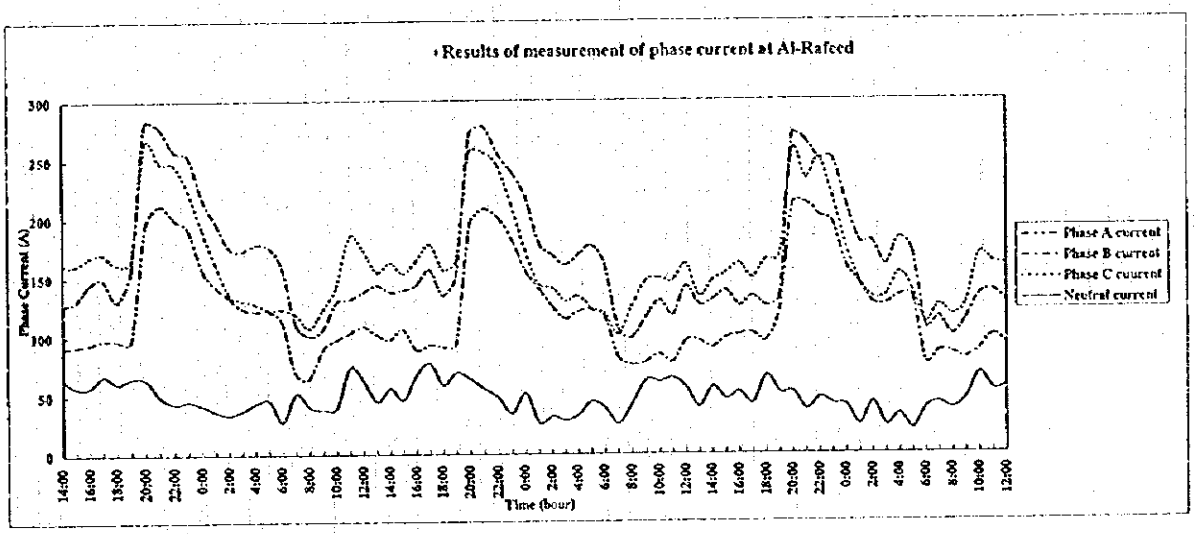


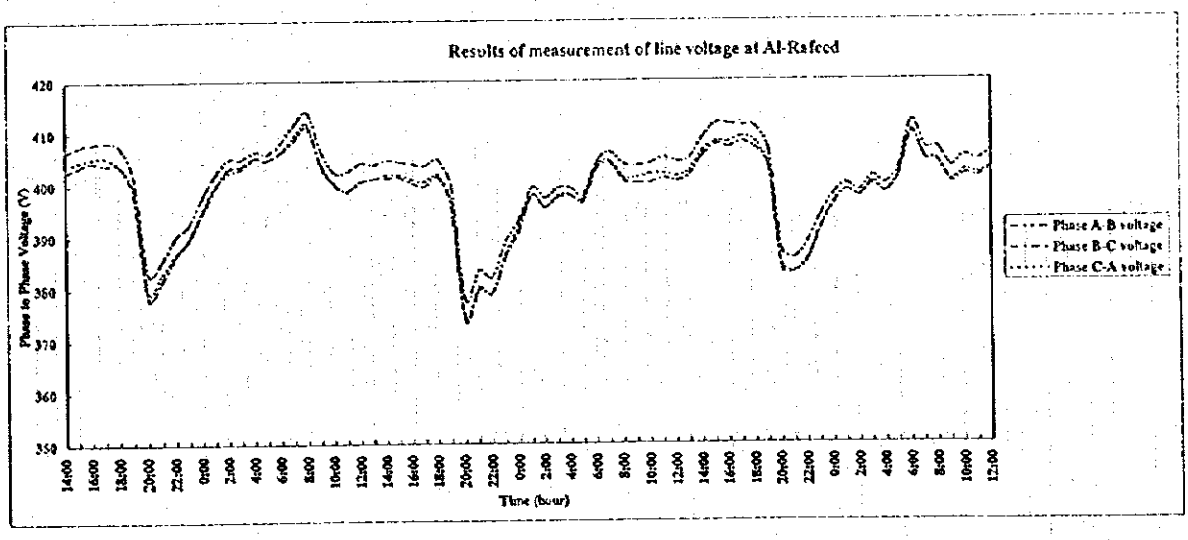



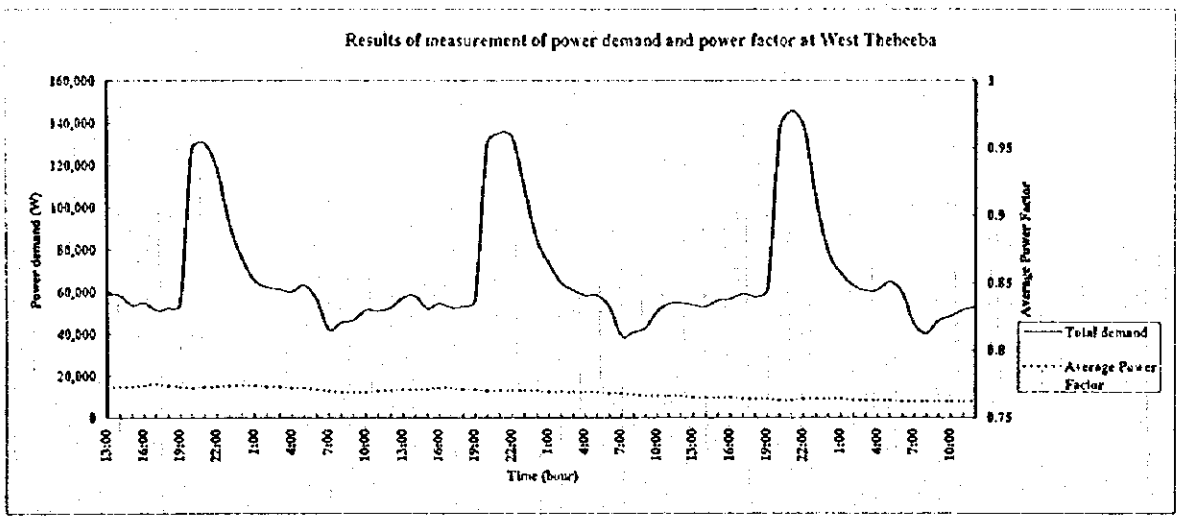
# Appendix 4.2-7 Result of measurement at Al-Rafeed

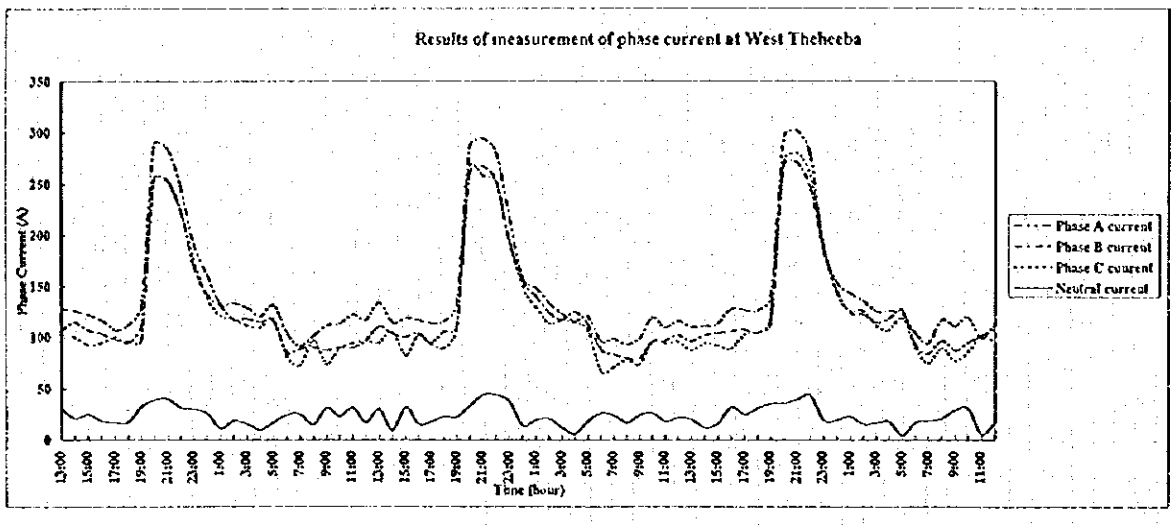


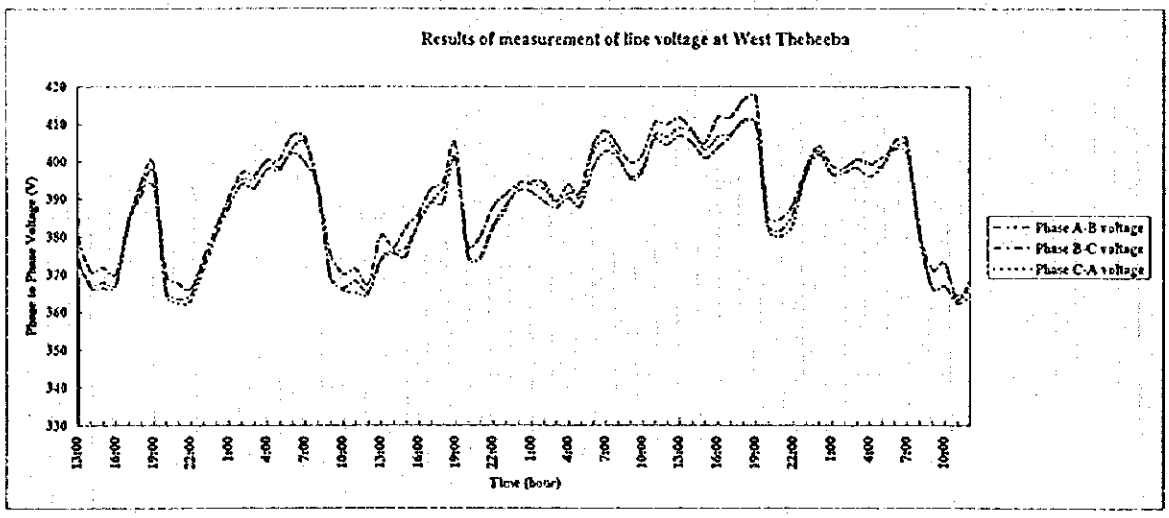



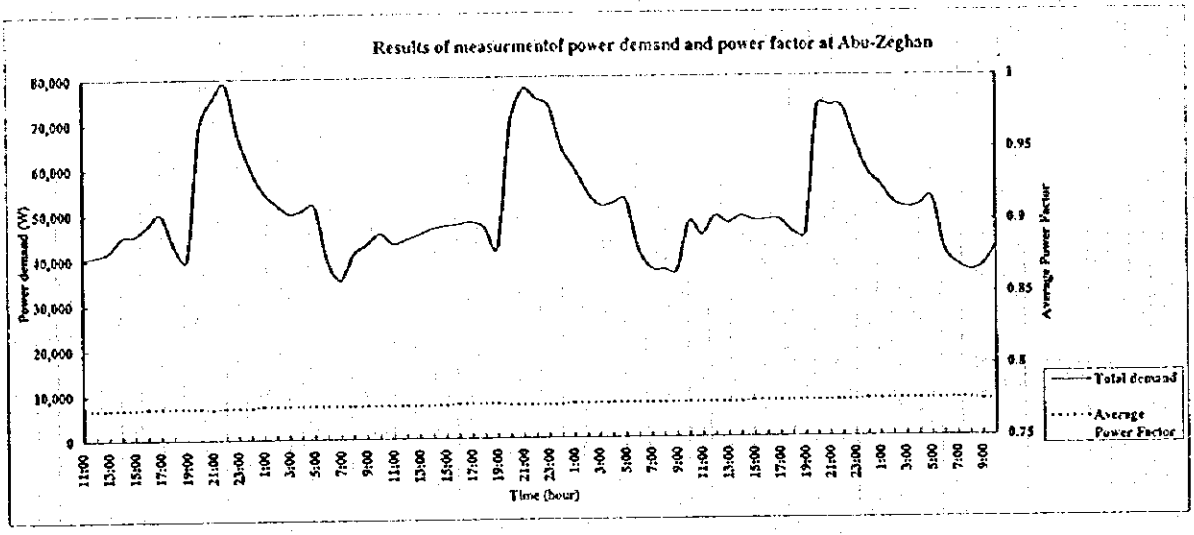
## Appendix 4.2-8 Result of measurement at West Theheeba

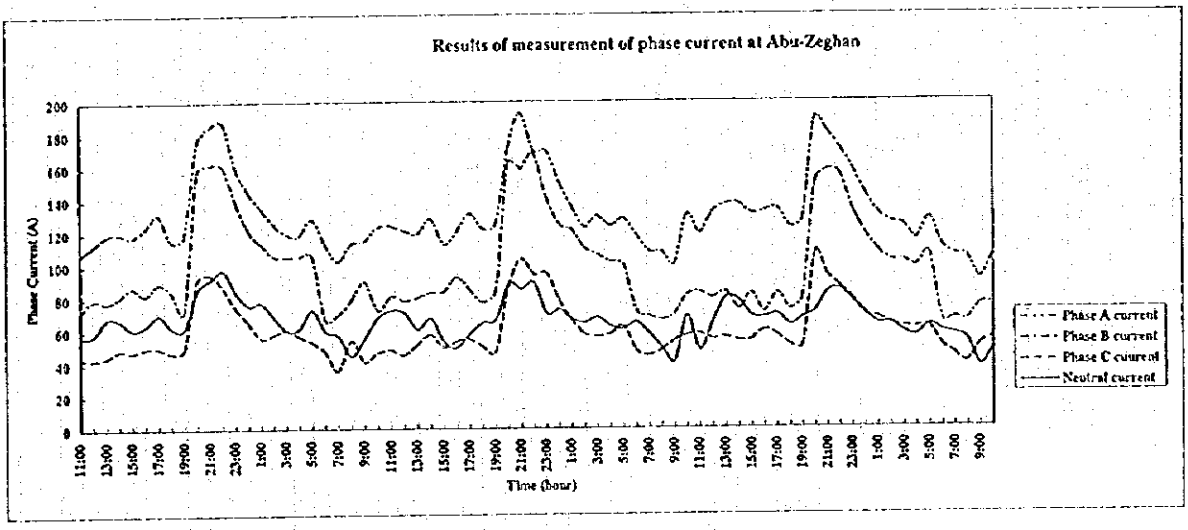


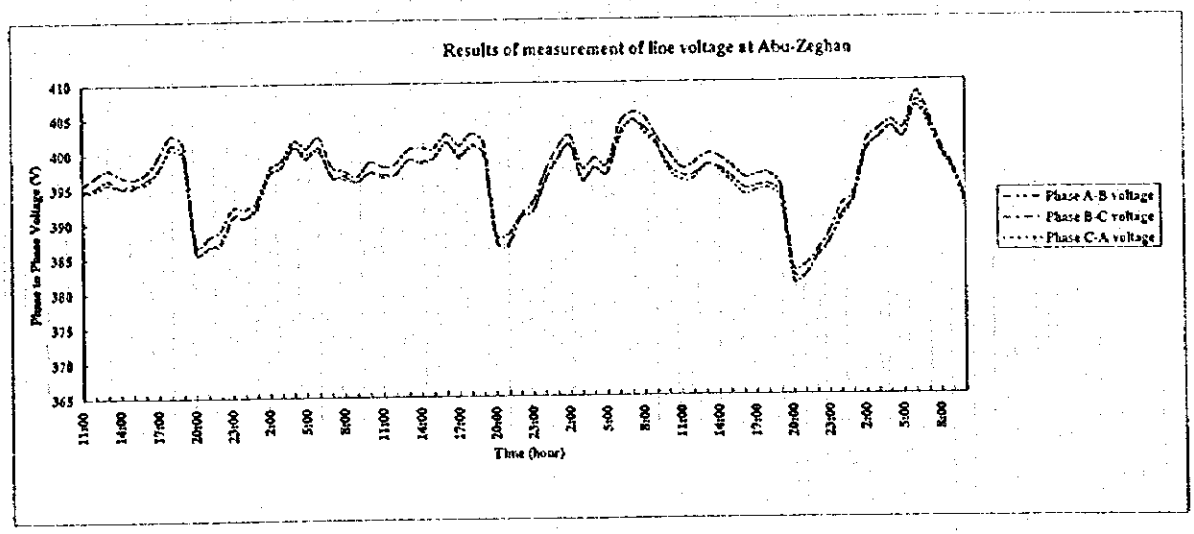



# Appendix 4.2-9 Result of measurement at Abu-Zeghan



## 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) | Wll:LV (GWh) | Wcm:MV (GWh) | Wcl:LV (GWh) | MV (GWh) | LV (GWh) | MV Part | LV Part |
| JEPCO | 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)/(402+4,074)=0.23

: Estimated Share Rate of MV sold Energy Based on Value above, NEPCO:0.23-alph=0.16, JEPCO:0.23+alph=0.3, IDECO:0.23

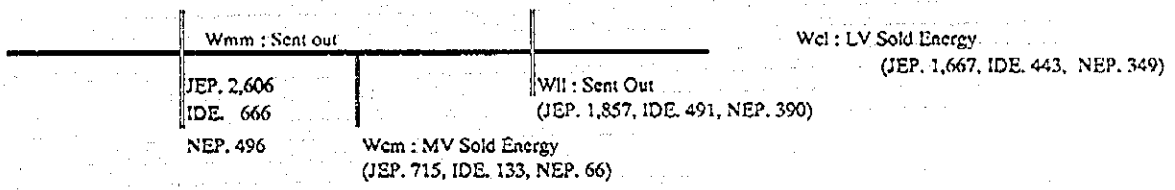
Wmm ; JEPCO=Roundup(2,605.9)=2,606 IDECO=Roundup(653.8+12)=666 NEPCO=3,768-2,606-666=496

Wll ; JEPCO=Roundup(1667/(1-(0.16+0.044)/2))=1,857 IDECO=Roundup(443/(1-(0.133+0.06)/2))=491 NEPCO=Roundup349/(1-0.1057)=390

Wcm ; JEPCO=Roundup(2,381.8*0.3)=715 IDECO=Roundup(575.8*0.23)=133 NEPCO=Roundup(414.6*0.16)=66

Wcl ; JEPCO=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-Wll-Wcm , LV=Wll-Wcl




(Wcl+Wcm)

JEPCO : 2,381.8, IDECO : 575.8, NEPCO : 575.8 (GWh)

Source : JEA Annual Report 1995 (P26)

Appendix 4.4-1　の補足説明

ＭＶ系統、ＬＶ系統での損失電力量は、次ぎの各項を推定したうえで算定した。

(1) ＭＶ、ＬＶ系統での販売電力量の推定

1994年に全ＭＶ系統に送電された電力のうち23%が工場等へ送電されている事と、ジョルダン側カウンターパートから示された概略の数値および各電力会社の地域特性を考慮し、配電系統におけるＭＶ系統での販売電力量ならびにＬＶ系統での販売電力量は次ぎのとおり推定した。

ＭＶ、ＬＶ系統での販売電力量の推定

| | ＭＶ系統で販売された電力量 | ＬＶ系統で販売された電力量 |
|---|---|---|
| ＮＥＰＣＯ | 66 GWh(16%) | 349 GWh(84%) |
| ＪＥＰＣＯ | 715 GWh(30%) | 1,667 GWh(70%) |
| ＩＤＥＣＯ | 133 GWh(23%) | 443 GWh(77%) |

(2) ＬＶ系統への送電電力量の推定

配電用変電所の２次側からＬＶ系統へ送電される電力は、前記(1) のＬＶ系統の販売電力量を代表系統で求めた損失率の平均で除した。（Table 4.2-1 参照）

なお、ＮＥＰＣＯについては、Table 4.1-2 に示した損失率を適用した。