East Coast Load Centers

Sandakan

Tawau

Lahad Datu

Semporna

Fig. A - 3.25 Trend of Power Demand Growth (1)

(Sandakan - 1)

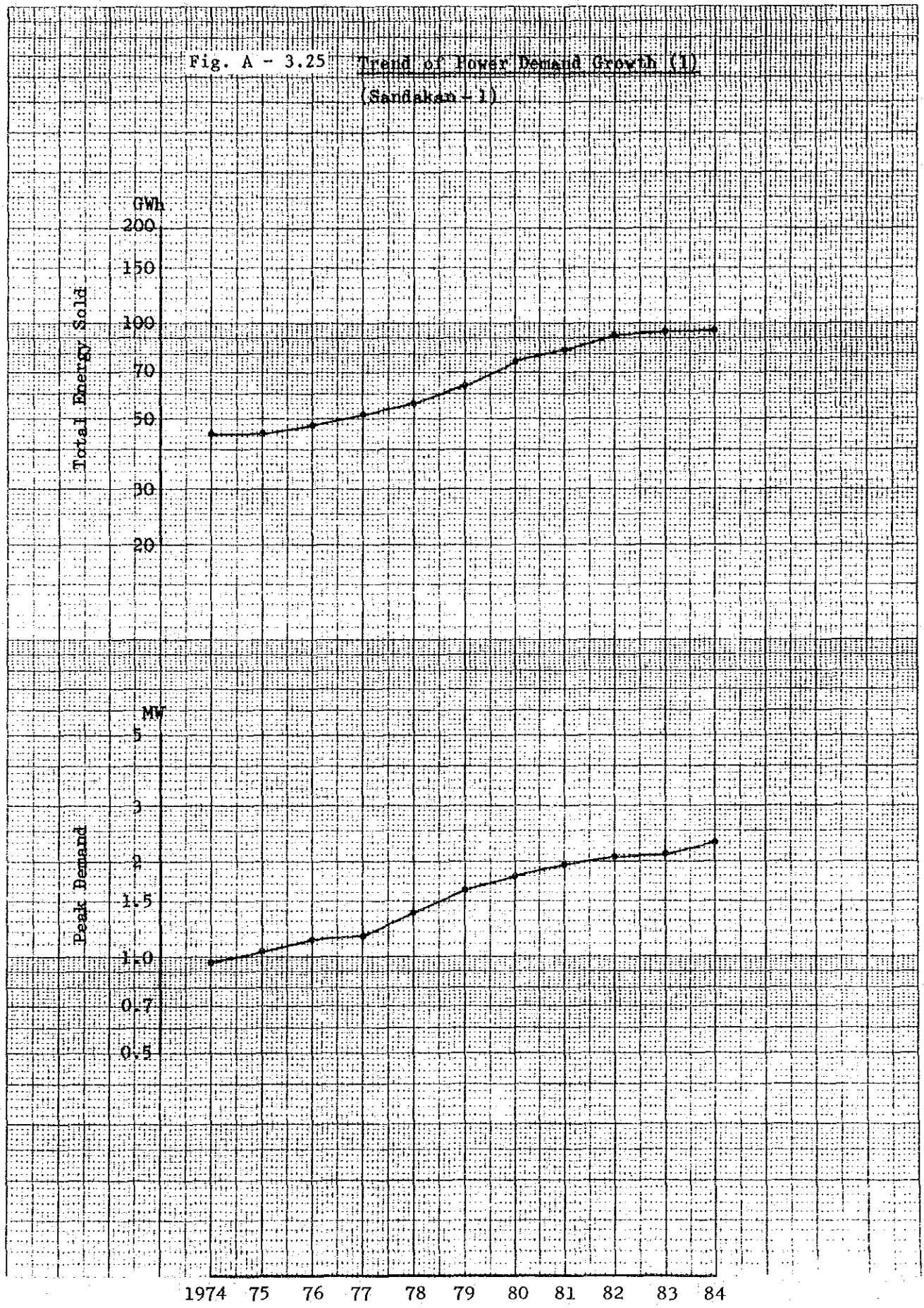


Fig. A - 3.26 Trend of Power Demand Growth (2)
(Sandakan - 2)

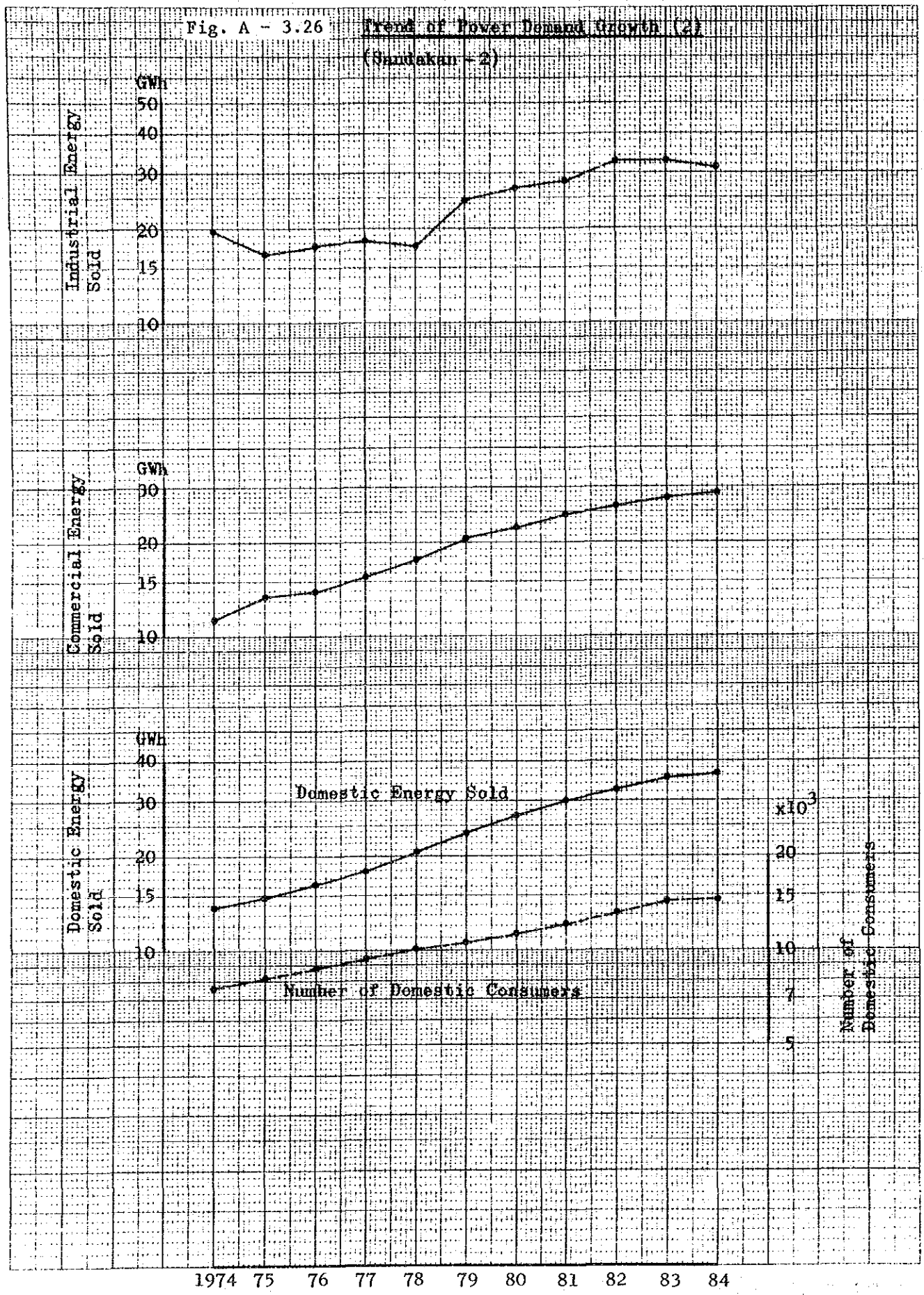


Fig. A - 3.27 Trend of Power Demand

(Sandakan)

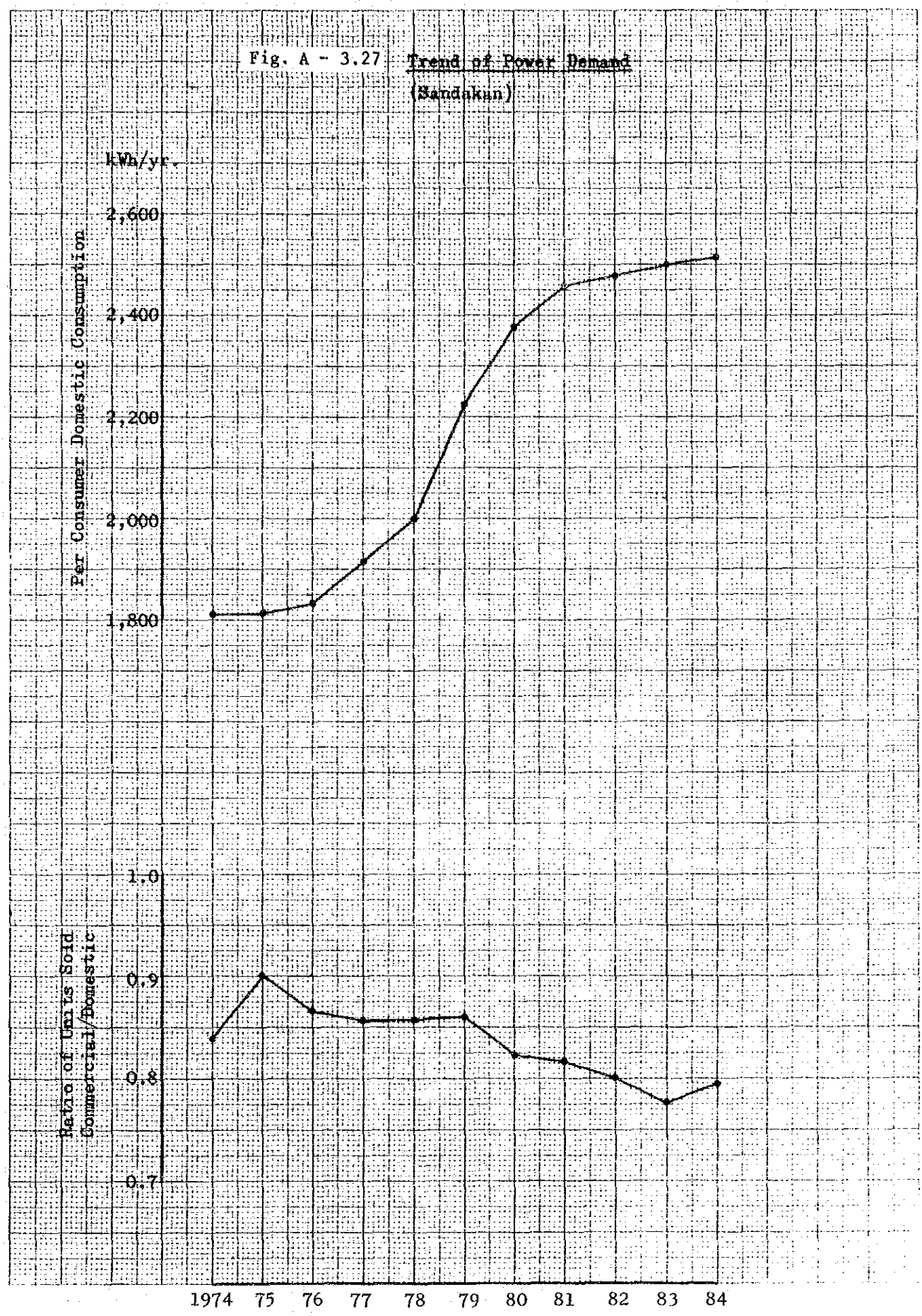


Fig. A - 3.28 Trend of Power Demand Growth (1)

(Tawau - 1)

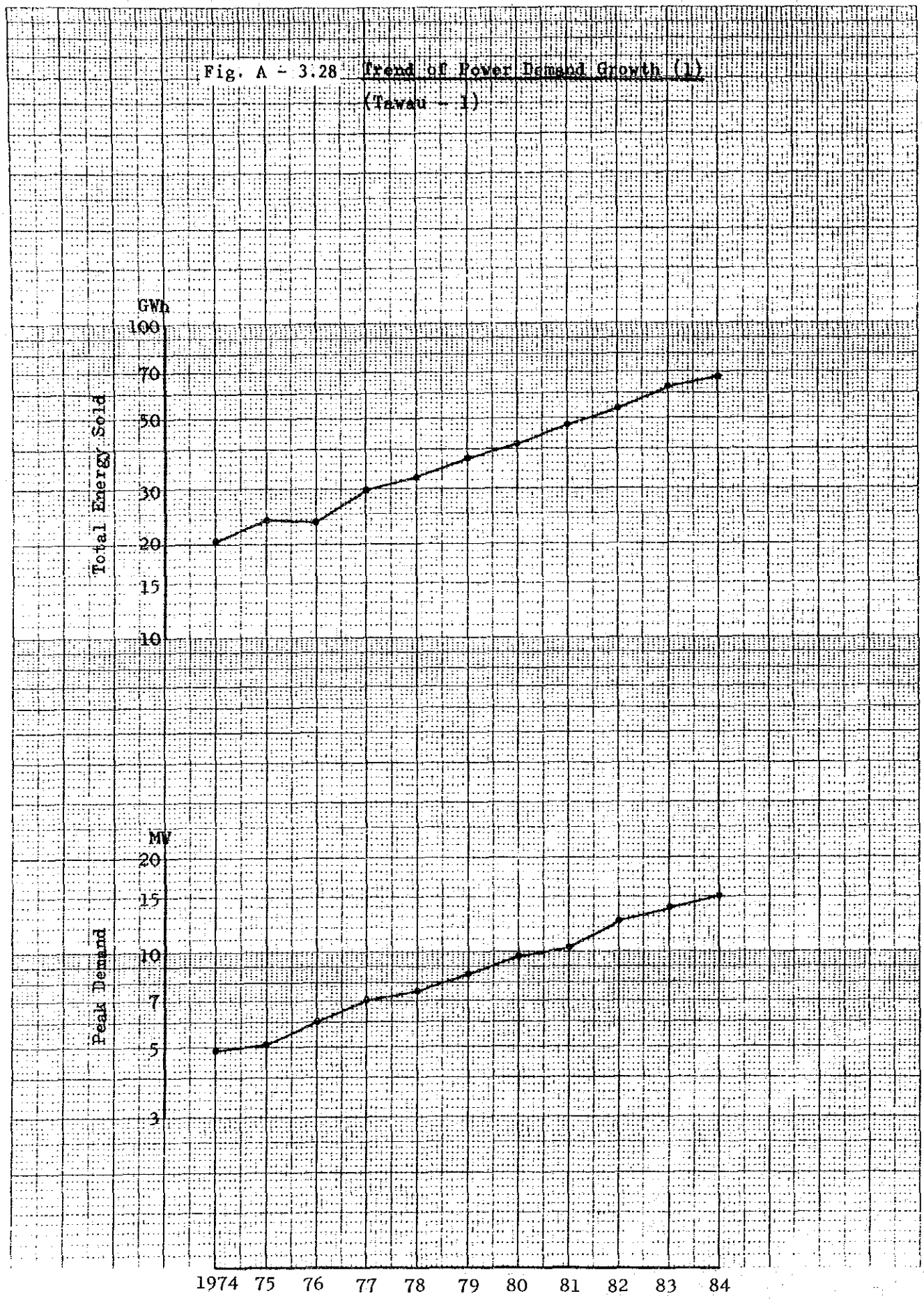


Fig. A - 3.29 Trend of Power Demand Growth (2)

(Taiwan - 2)

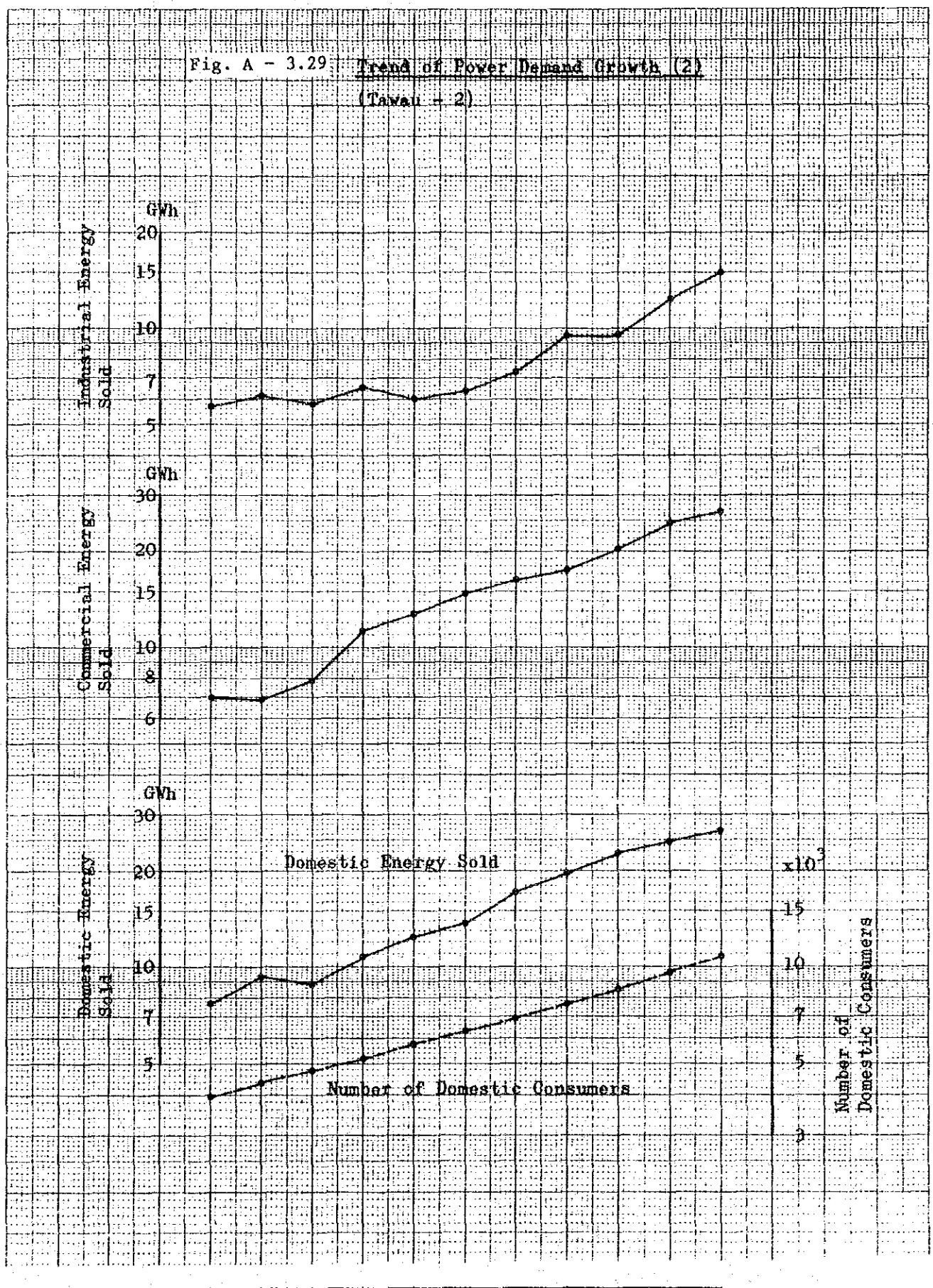


Fig. A - 3.30 Trend of Power Demand (Tawau)

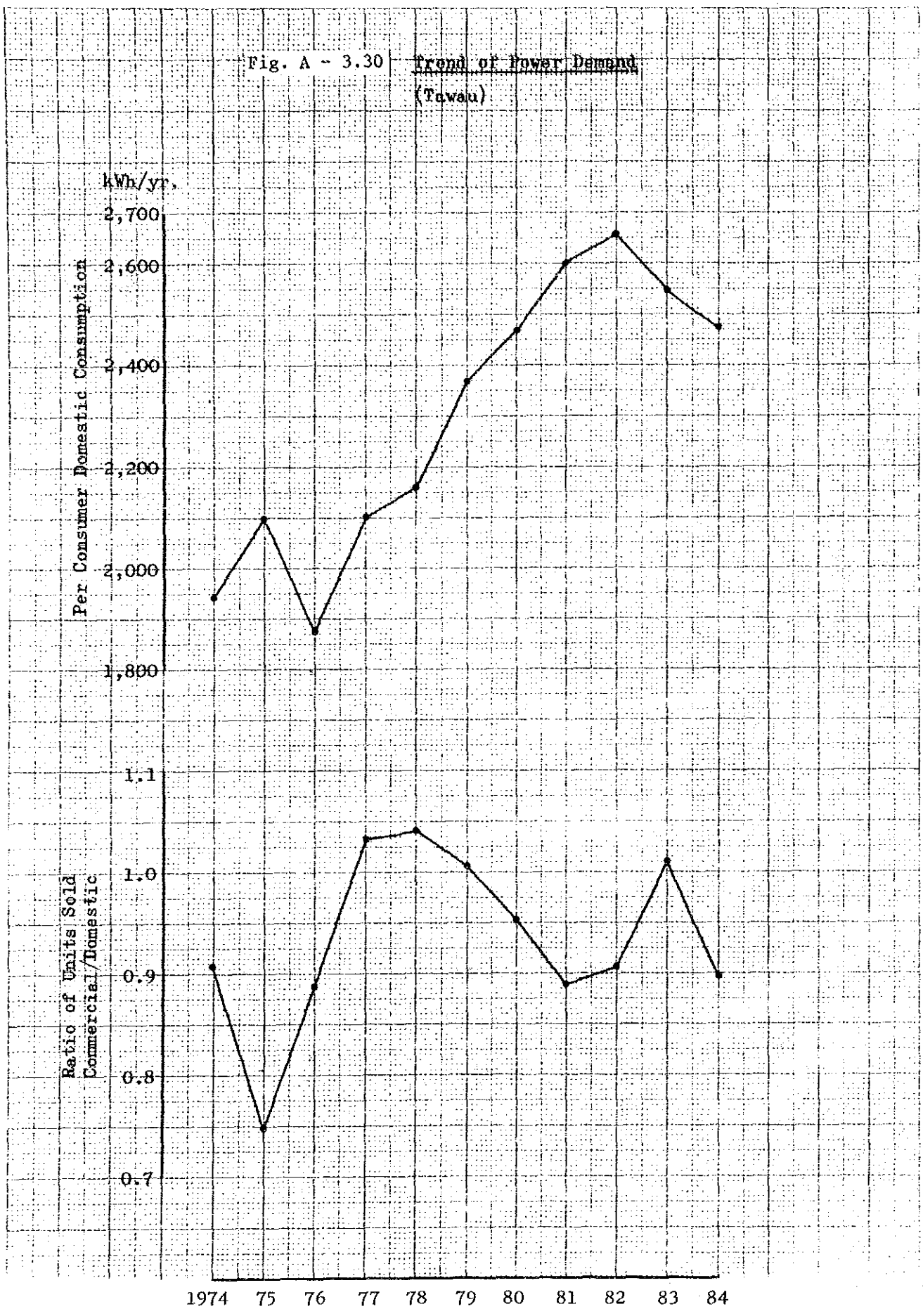


Fig. A - 3.31 Trend of Power Demand Growth (1)
(Lahad Datu-1)

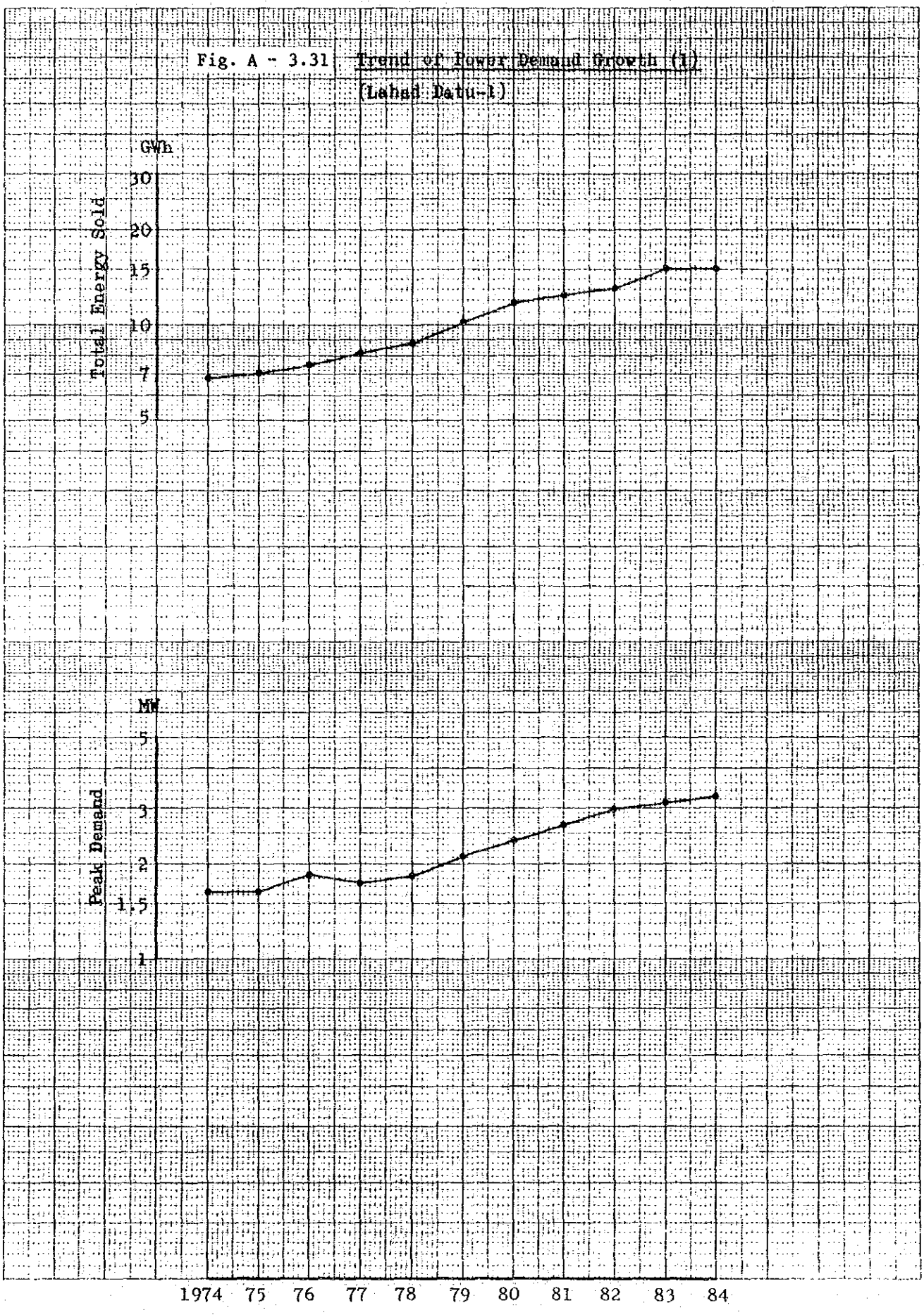


Fig. A - 3.32 Trend of Power Demand Growth (2)
(Lahad Datu-2)

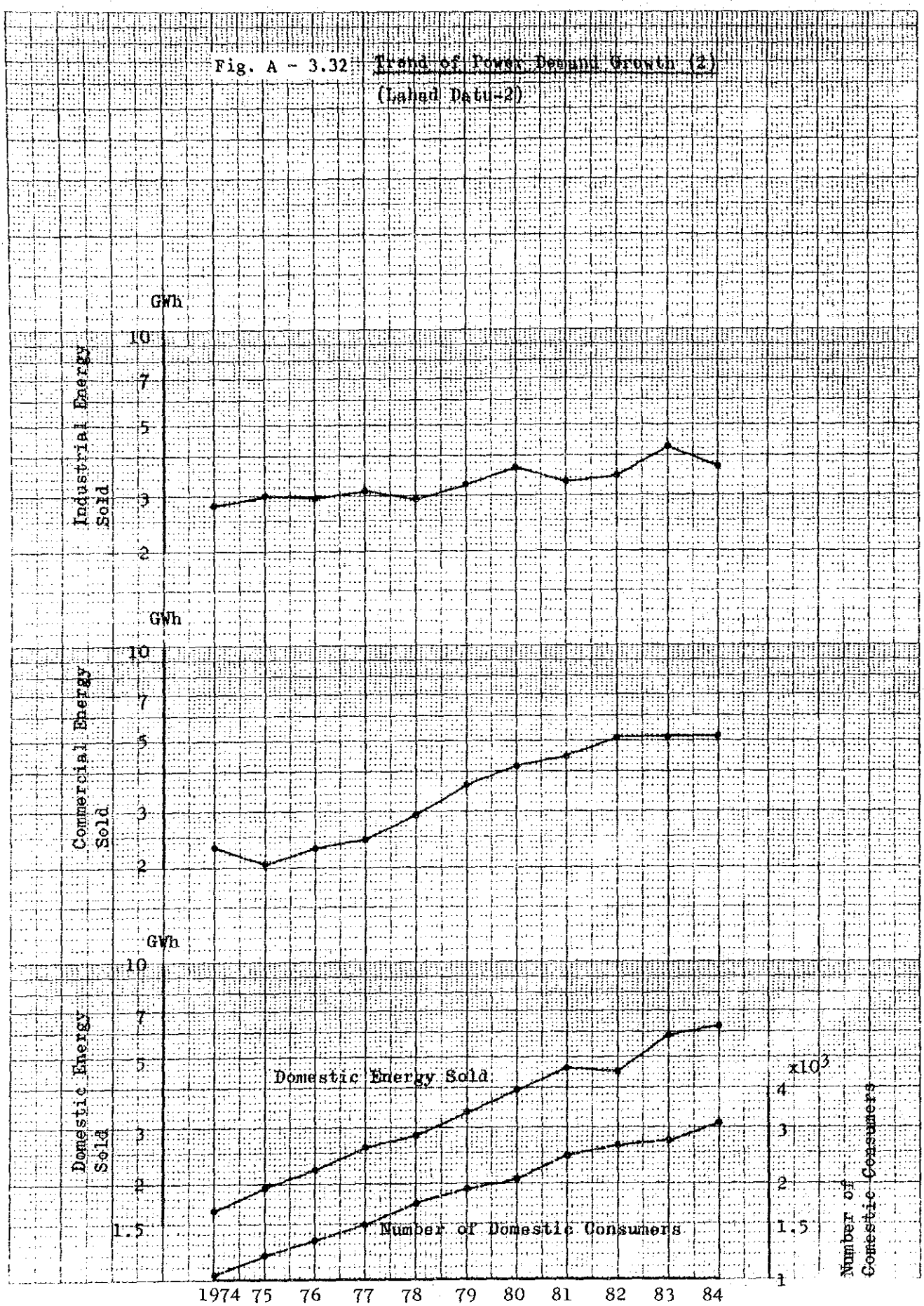


Fig. A - 3.33 Trend of Power Consumption
(Lahad Datu)

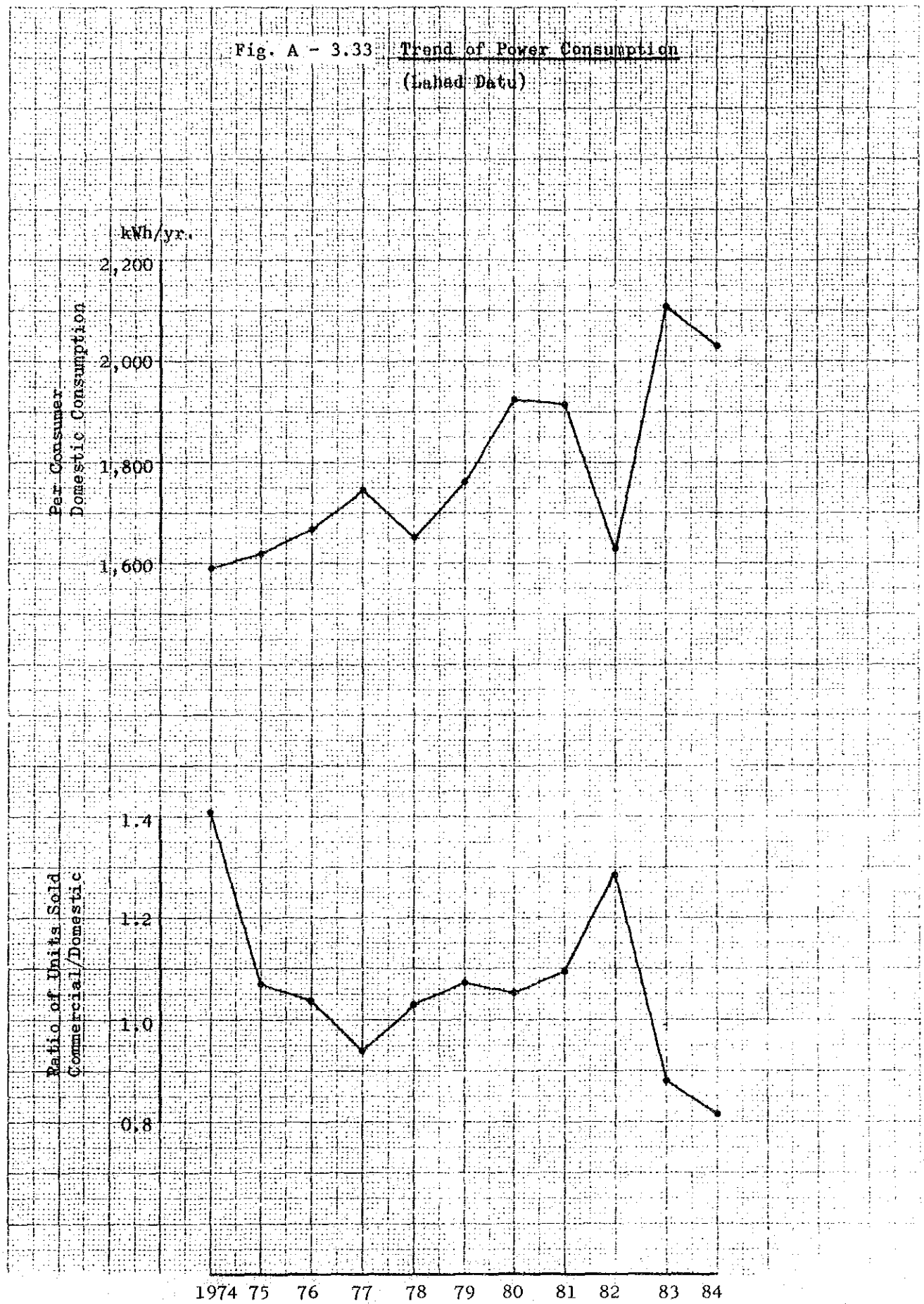


Fig. A - 3.34 Trend of Power Demand Growth (1)
(Semporna-1)

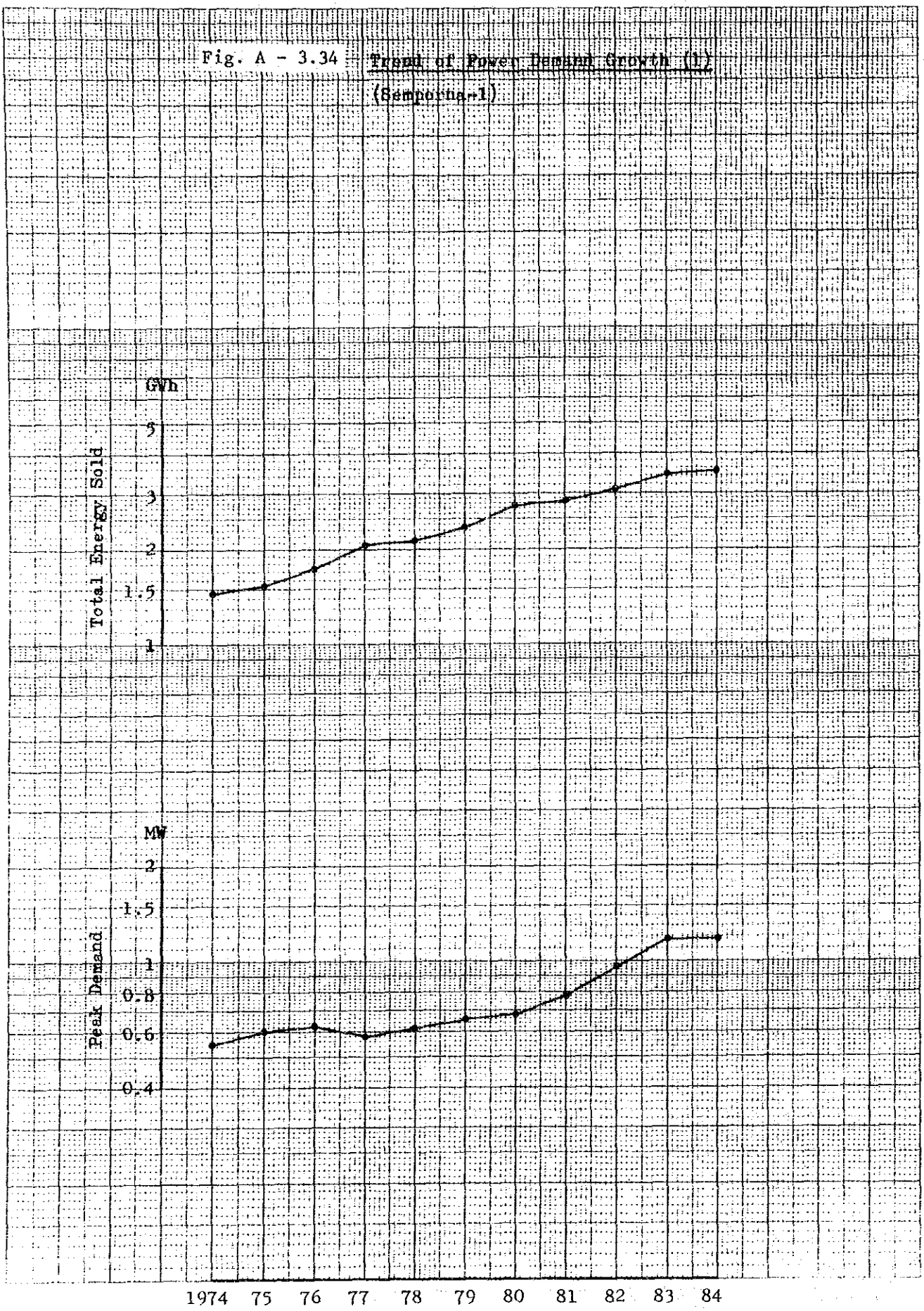


Fig. A - 3.35 Trend of Power Demand Growth (2)
(Semporna-2)

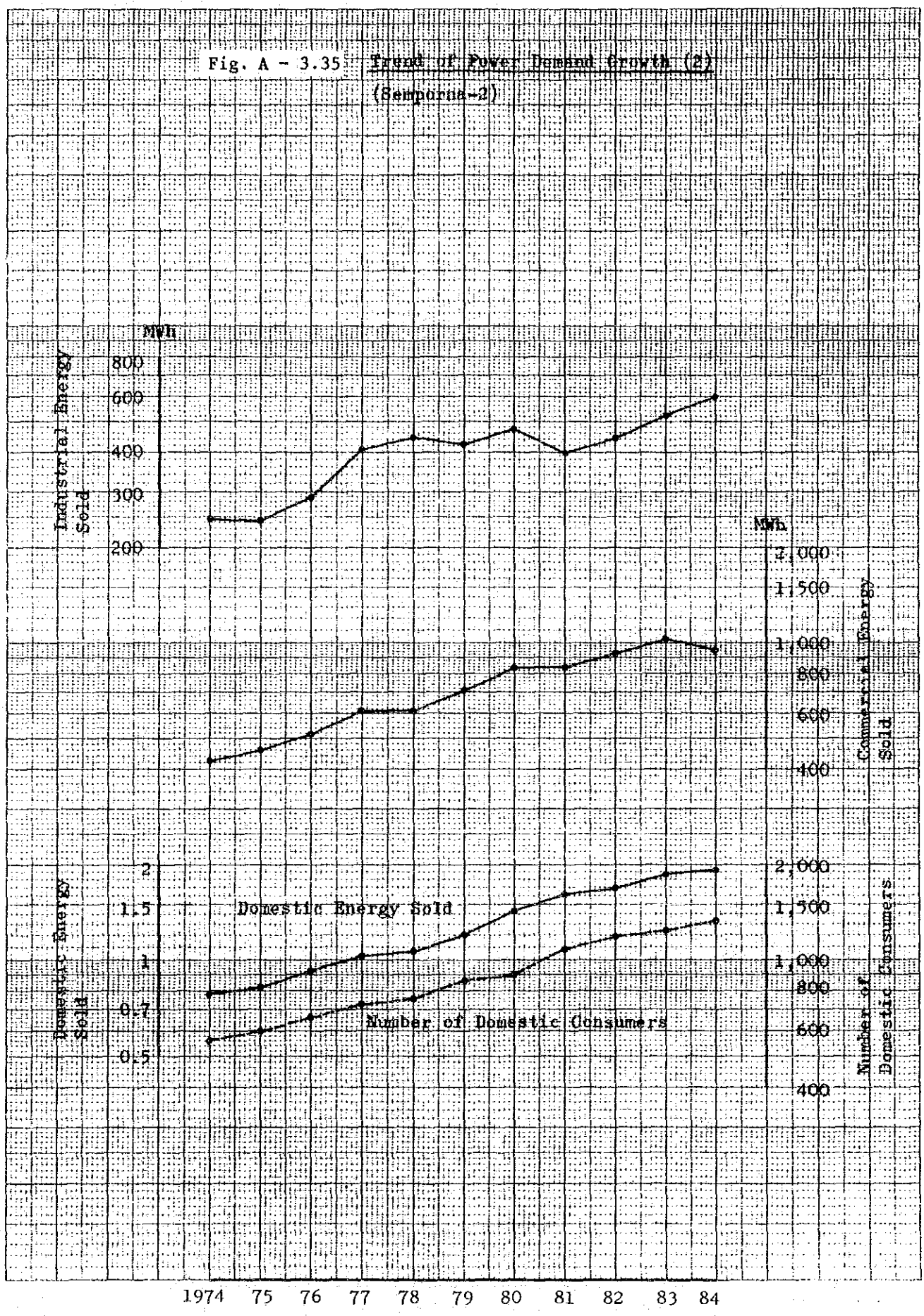


Fig. A - 3.36 Trend of Power Demand
(Semporna)

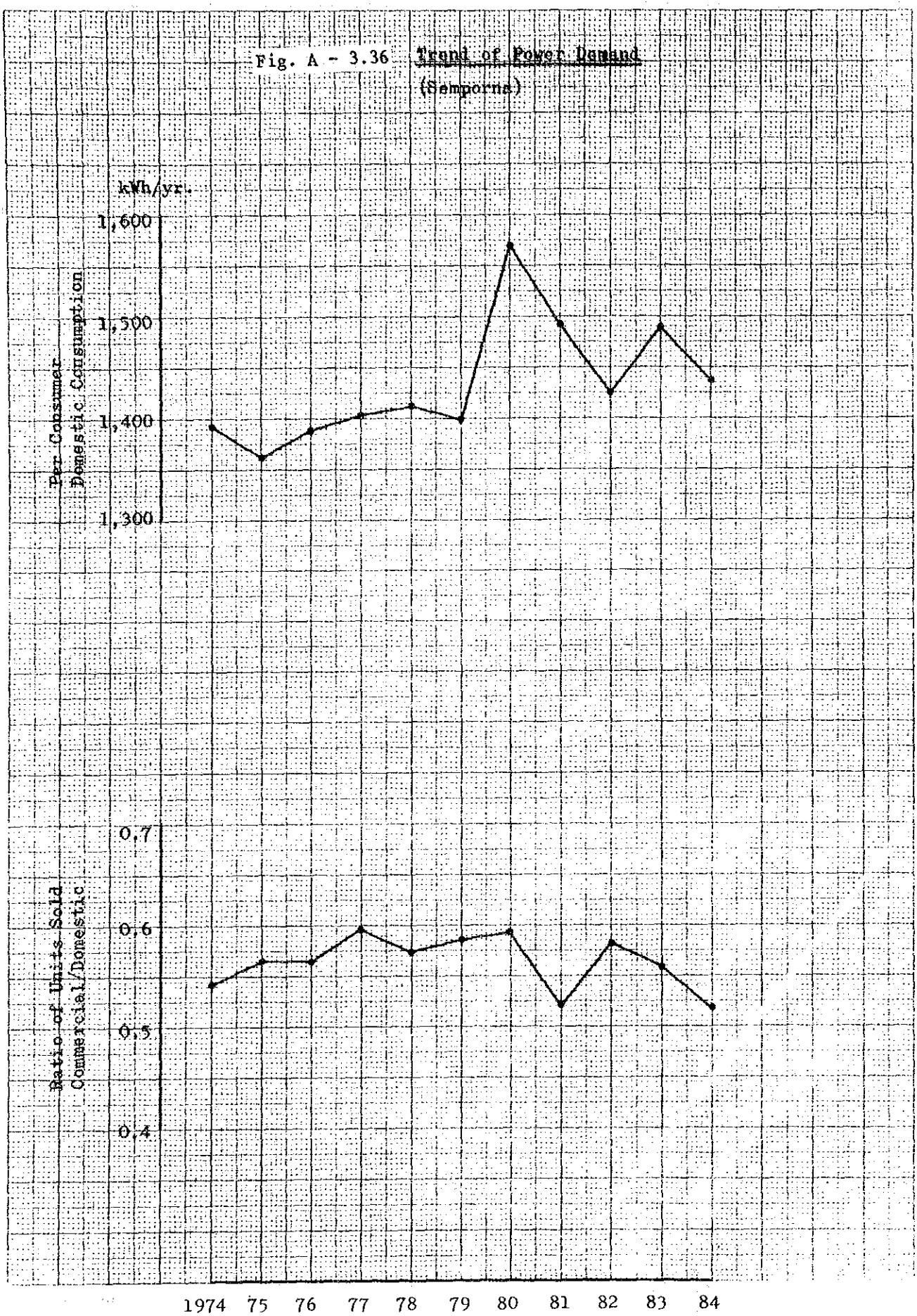
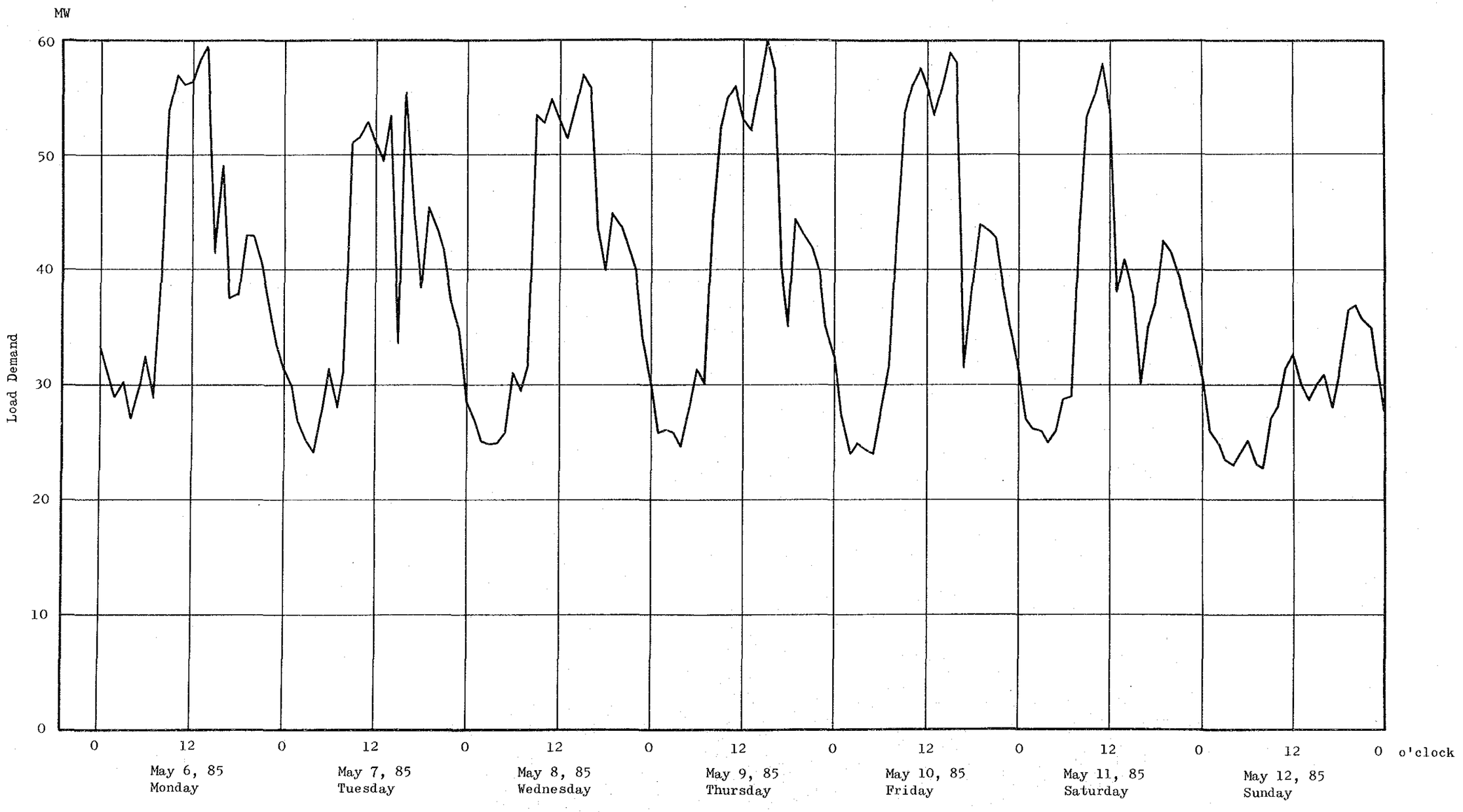


Fig. A-3.37 Weekly Load Curve (May 6 - May 12, 1985)

(Kota Kinabalu)



## A-3.2 Rural Electrification Around Proposed Sook Reservoir

The electrification of the villages which will be affected by the construction of the Sook Reservoir is possible by extending the existing 11 kV power system and by constructing new lines from the planned Sook Power Station.

At present, the Keningau 11 kV power system to these areas is existing up to Kg. Ansip toward the road leading to the proposed power station site and up to the teacher's training college site along the Keningau - Pensiangan Road.

Within the submerged area of the Sook Reservoir, there are fourteen villages; Batu Empat Biah, Biah Tengah, Sri Lalian, Liwandon Ansip, Biah Laut, Memplot, Kuala Puntih, Mambule, Kuala Tigasa, Suan, Totogop, Baransanon, Baitah and Rancatigan Biah. The total number of houses is estimated to be about 330 with the population of about 2,200. Most of them are supposed to find their settlement places surrounding the newly created reservoir.

The power supply to these areas will be made by

(a) Extension of the existing 11 kV line from Keningau up to Ansip up to the new power station for the power supply to this line from either of the Keningau Substation or the new power station.

(b) Construction of new 11 kV line along the relocated road on the left bank of the Sook Reservoir.

(c) Extension of the existing 11 kV power system along the relocated Keningau - Pensiangan Road on the right bank from the teacher's training college site.

The actual construction plan under (b) and (c) above shall be prepared after the new settlement plan of immigrants has been

finalized. The total length of 11 kV lines to be constructed for the power supply to the affected areas would be about 20 km. The total number of houses which will be supplied electricity by the new 11 kV lines would be 500 to 600 with annnual per consumer power consumption of 1,000 kWh in average. The peak demand would be about 150 kW assuming an annual load factor of about 40 percent.

FIGURE NO.A-3.38

N

LEGEND

- DISTRICT ROAD
- TIMBER ROAD
- RELOCATION ROAD

EXTENSION OF EXISTING 11KV LINE

SADDLE DAM

MAIN DAM

RESERVOIR

TO KENINGAU SUBSTATION

NEW CONSTRUCTION OF 11 KV LINE

SCALE 0 2.5 km

( 1 : 50,000 )

| TENOM PANGI PHASE III |
|---|
| SOOK SITE |
| RELOCATION ROAD |
| SEB / JICA |

TABLE A-4.1 RECHECK OF SCALE OF EXISTING TENOM PANGI PROJECT (PHASES I + II)

| Item | Installed capacity (MW) | | | | |
|---|---|---|---|---|---|
| | 44 | 66 (Existing) | 88 | 110 | 132 |
| 95% dependable power (MW) | 44.0 | 45.0 | 45.0 | 45.0 | 45.0 |
| Firm energy (GWh/yr ) | 225.8 | 331.6 | 428.6 | 516.2 | 595.3 |
| Dump energy (GWh/yr ) | 139.0 | 184.6 | 214.2 | 224.5 | 209.5 |
| Total energy (GWh/yr ) | 364.8 | 516.2 | 642.8 | 740.7 | 804.8 |
| Power benefit ($10^3$US$) 1/ | 10,430 | 10,670 | 10,670 | 10,670 | 10,670 |
| Energy benefit ($10^3$US$) | 7,680 | 11,020 | 13,930 | 16,340 | 18,200 |
| Total benefit ($10^3$US$) | 18,110 | 21,690 | 24,600 | 27,010 | 28,870 |
| Installation cost ($10^3$US$) | 104,500 | 133,100 | 168,400 | 205,700 | 243,900 |
| Annual cost ($10^3$US$) 2/ | 12,110 | 15,430 | 19,520 | 23,840 | 28,270 |
| Annual net benefit benefit($10^3$US$) | 6,000 | 6,260 | 5,080 | 3,170 | 600 |

1/: Unit power benefit (1985/86 price):

Capacity value = 237.0 US$/kW

Energy value = 0.026 US$/kWh

2/: 50 years project life, 10% discount rate and 1.5 per cent OMR costs.

TABLE A-4.2 ESTIMATED CONSTRUCTION COST
(EXISTING TENOM PANGI P/S)

(Unit: $10^6$US$)

| | Item | Installed capacity (MW) | | | | |
|---|---|---|---|---|---|---|
| | | 44 | 66 | 88 | 110 | 132 |
| 1. | Preparatory work | 6.0 | 6.1 | 8.9 | 11.6 | 14.4 |
| 2. | Diversion work | 4.8 | 4.8 | 4.8 | 4.8 | 4.8 |
| 3. | Intake weir | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| 4. | Intake structure | 9.0 | 9.2 | 9.5 | 9.8 | 10.7 |
| 5. | Waterway/Surge tank | 22.2 | 33.4 | 44.5 | 57.3 | 70.0 |
| 6. | Penstock | 2.6 | 3.2 | 4.2 | 5.2 | 6.0 |
| 7. | Powerhouse/tailrace | 5.3 | 7.9 | 10.0 | 12.2 | 14.7 |
| 8. | Switch yard | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 9. | Gate and penstock | 7.9 | 8.7 | 12.1 | 15.5 | 18.9 |
| 10. | Generating equipment | 12.0 | 18.0 | 24.0 | 30.0 | 36.0 |
| 11. | Transmission line | 9.3 | 9.3 | 9.3 | 9.3 | 9.3 |
| 12. | Substation | 9.7 | 14.6 | 17.6 | 20.6 | 23.6 |
| | Subtotal: | 95.9 | 122.3 | 152.0 | 183.4 | 215.5 |
| 13. | Engineering | 8.6 | 5.9 | 13.2 | 15.7 | 18.3 |
| 14. | Administration | | 4.9 | | | |
| 15. | Physical contingency | - | - | 3.2 | 6.6 | 10.1 |
| | Total: | 104.5 | 133.1 | 168.4 | 205.7 | 243.9 |

TABLE A-4.3 COMPARATIVE STUDY FOR SOOK - TENOM PANGI POWER SYSTEM

| Case | Sook reservoir | | Installed capacity (MW) | | | Dependable power | Energy output (GWh) | | | Power benefit ($10^6$US$) | | | Construction cost ($10^6$US$) | | | Annual cost | Annual net benefit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HWL (El.-m) | Storage capacity ($10^6m^3$) | Sook | Pangi ext. | Total | (MW) | Firm | Dump | Total | Capacity | Energy | Total | Sook | Pangi ext. | Total | ($10^6$US$) | ($10^6$US$) |
| 17-a | 310 | 400 | 10 | 22 | 32 | 50.7 | 175.3 | 27.1 | 202.4 | 12.0 | 4.9 | 16.9 | 92.7 | 39.8 | 132.5 | 15.4 | 1.5 |
| 18-a | 310 | 400 | 20 | 22 | 42 | 57.5 | 226.0 | 11.8 | 237.8 | 13.6 | 6.0 | 19.6 | 100.5 | 39.8 | 140.3 | 16.3 | 3.3 |
| 19-a | 310 | 400 | 30 | 22 | 52 | 63.9 | 262.1 | 0 | 262.1 | 15.1 | 6.8 | 21.9 | 106.5 | 39.8 | 146.3 | 17.0 | 4.9 |
| 20-a | 310 | 400 | 40 | 22 | 62 | 45.6 | 282.2 | 0 | 282.2 | 10.8 | 7.3 | 18.1 | 112.8 | 39.8 | 152.6 | 17.7 | 0.4 |
| 21-a | 310 | 500 | 10 | 22 | 32 | 50.3 | 177.4 | 26.6 | 204.0 | 11.9 | 5.0 | 16.9 | 93.2 | 39.8 | 133.0 | 15.4 | 1.5 |
| 22-a | 310 | 500 | 20 | 22 | 42 | 57.0 | 228.5 | 10.7 | 239.2 | 13.5 | 6.1 | 19.6 | 101.0 | 39.8 | 140.8 | 16.3 | 3.3 |
| 23-a | 310 | 500 | 30 | 22 | 52 | 60.6 | 265.0 | 0 | 265.0 | 14.4 | 6.9 | 21.3 | 107.4 | 39.8 | 147.2 | 17.1 | 4.2 |
| 24-a | 310 | 500 | 40 | 22 | 62 | 57.6 | 284.5 | 0 | 284.5 | 13.7 | 7.4 | 21.1 | 113.4 | 39.8 | 153.2 | 17.8 | 3.3 |
| 25-a | 310 | 550 | 10 | 22 | 32 | 49.7 | 178.5 | 26.4 | 204.9 | 11.8 | 5.0 | 16.8 | 93.5 | 39.8 | 133.3 | 15.4 | 1.4 |
| 26-a | 310 | 550 | 20 | 22 | 42 | 56.6 | 229.2 | 10.5 | 239.7 | 13.4 | 6.1 | 19.5 | 101.5 | 39.8 | 141.3 | 16.4 | 3.1 |
| 27-a | 310 | 550 | 30 | 22 | 52 | 59.7 | 265.9 | 0 | 265.9 | 14.1 | 6.9 | 21.0 | 107.9 | 39.8 | 147.7 | 17.1 | 3.9 |
| 28-a | 310 | 550 | 40 | 22 | 62 | 61.6 | 285.5 | 0 | 285.5 | 14.6 | 7.4 | 22.0 | 114.4 | 39.8 | 154.2 | 17.9 | 4.1 |
| 33-a | 315 | 600 | 10 | 22 | 32 | 50.5 | 179.2 | 26.7 | 205.9 | 12.0 | 5.0 | 17.0 | 116.6 | 39.8 | 156.4 | 18.1 | -1.1 |
| 34-a | 315 | 600 | 20 | 22 | 42 | 58.6 | 230.5 | 13.4 | 243.9 | 13.9 | 6.2 | 20.1 | 123.9 | 39.8 | 163.7 | 19.0 | 1.1 |
| 35-a | 315 | 600 | 30 | 22 | 52 | 64.7 | 271.2 | 0 | 271.2 | 15.3 | 7.1 | 22.4 | 129.9 | 39.8 | 169.7 | 19.7 | 2.7 |
| 36-a | 315 | 600 | 40 | 22 | 62 | 67.4 | 293.9 | 0 | 293.9 | 16.0 | 7.6 | 23.6 | 136.0 | 39.8 | 175.8 | 20.4 | 3.2 |
| 37-a | 315 | 700 | 10 | 22 | 32 | 50.8 | 180.2 | 26.6 | 206.8 | 12.0 | 5.0 | 17.0 | 116.6 | 39.8 | 156.4 | 18.1 | -1.1 |
| 38-b | 315 | 700 | 20 | 22 | 42 | 59.1 | 231.7 | 13.1 | 244.8 | 14.0 | 6.2 | 20.2 | 124.1 | 39.8 | 163.9 | 19.0 | 1.2 |
| 39-c | 315 | 700 | 30 | 22 | 52 | 65.0 | 272.2 | 0 | 272.2 | 15.4 | 7.1 | 22.5 | 130.0 | 39.8 | 169.8 | 19.7 | 2.8 |
| 40-d | 315 | 700 | 40 | 22 | 62 | 64.2 | 296.0 | 0 | 296.0 | 15.2 | 7.7 | 22.9 | 136.3 | 39.8 | 176.1 | 20.4 | 2.5 |

TABLE A-4.4 COMPARATIVE STUDY FOR SOOK - TENOM PANGI POWER SYSTEM

| Case | Sook reservoir | | Installed capacity (MW) | | | Dependable power | Energy output (GWh) | | | Power benefit ($10^6$US$) | | | Construction cost ($10^6$US$) | | | Annual cost | Annual net benefit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HWL (El.-m) | Storage capacity ($10^6m^3$) | Sook | Pangi ext. | Total | (MW) | Firm | Dump | Total | Capacity | Energy | Total | Sook | Pangi ext. | Total | ($10^6$US$) | ($10^6$US$) |
| 17-b | 310 | 400 | 10 | 66 | 76 | 42.6 | 359.9 | 0 | 359.9 | 10.1 | 9.4 | 19.5 | 92.7 | 110.8 | 203.5 | 23.6 | -4.1 |
| 18-b | 310 | 400 | 20 | 66 | 86 | 45.6 | 398.2 | 0 | 398.2 | 10.8 | 10.4 | 21.2 | 100.5 | 110.8 | 211.3 | 24.5 | -3.3 |
| 19-b | 310 | 400 | 30 | 66 | 96 | 48.1 | 425.5 | 0 | 425.5 | 11.4 | 11.1 | 22.5 | 106.5 | 110.8 | 217.3 | 25.2 | -2.7 |
| 20-b | 310 | 400 | 40 | 66 | 106 | 49.4 | 444.4 | 0 | 444.4 | 11.7 | 11.6 | 23.3 | 112.8 | 110.8 | 223.6 | 25.9 | -2.6 |
| 21-b | 310 | 500 | 10 | 66 | 76 | 42.3 | 363.2 | 0 | 363.2 | 10.0 | 9.4 | 19.4 | 93.2 | 110.8 | 204.0 | 23.6 | -4.2 |
| 22-b | 310 | 500 | 20 | 66 | 86 | 45.4 | 401.4 | 0 | 401.4 | 10.8 | 10.4 | 21.2 | 101.0 | 110.8 | 211.8 | 24.5 | -3.3 |
| 23-b | 310 | 500 | 30 | 66 | 96 | 48.1 | 428.8 | 0 | 428.8 | 11.4 | 11.1 | 22.5 | 107.4 | 110.8 | 218.2 | 25.3 | -2.8 |
| 24-b | 310 | 500 | 40 | 66 | 106 | 50.9 | 447.6 | 0 | 447.6 | 12.1 | 11.6 | 23.7 | 113.4 | 110.8 | 224.2 | 26.0 | -2.6 |
| 25-b | 310 | 550 | 10 | 66 | 76 | 42.1 | 364.8 | 0 | 364.8 | 10.0 | 9.5 | 19.5 | 93.5 | 110.8 | 204.3 | 23.7 | -4.2 |
| 26-b | 310 | 550 | 20 | 66 | 86 | 45.1 | 402.6 | 0 | 402.6 | 10.7 | 10.5 | 21.2 | 101.5 | 110.8 | 212.3 | 24.6 | -3.4 |
| 27-b | 310 | 550 | 30 | 66 | 96 | 48.0 | 429.7 | 0 | 429.7 | 11.4 | 11.2 | 22.6 | 107.9 | 110.8 | 218.7 | 25.3 | -2.7 |
| 28-b | 310 | 550 | 40 | 66 | 106 | 50.8 | 447.9 | 0 | 447.9 | 12.0 | 11.6 | 23.6 | 114.4 | 110.8 | 225.2 | 26.1 | -2.5 |
| 33-b | 315 | 600 | 10 | 66 | 76 | 42.6 | 367.1 | 0 | 367.1 | 10.1 | 9.5 | 19.6 | 116.6 | 110.8 | 227.4 | 26.4 | -6.7 |
| 34-b | 315 | 600 | 20 | 66 | 86 | 48.9 | 407.3 | 0 | 407.3 | 11.6 | 10.6 | 22.2 | 123.9 | 110.8 | 234.7 | 27.2 | -5.0 |
| 35-b | 315 | 600 | 30 | 66 | 96 | 48.5 | 437.7 | 0 | 437.7 | 11.5 | 11.4 | 22.9 | 129.9 | 110.8 | 240.7 | 27.9 | -5.0 |
| 36-b | 315 | 600 | 40 | 66 | 106 | 50.9 | 457.9 | 0 | 457.9 | 12.1 | 11.9 | 24.0 | 136.0 | 110.8 | 246.8 | 28.6 | -4.6 |
| 37-b | 315 | 700 | 10 | 66 | 76 | 49.0 | 369.4 | 0 | 369.4 | 11.6 | 9.6 | 21.2 | 116.6 | 110.8 | 227.4 | 26.4 | -5.2 |
| 38-b | 315 | 700 | 20 | 66 | 86 | 48.0 | 409.7 | 0 | 409.7 | 11.4 | 10.7 | 22.1 | 124.1 | 110.8 | 234.9 | 27.2 | -5.1 |
| 39-b | 315 | 700 | 30 | 66 | 96 | 48.2 | 440.3 | 0 | 440.3 | 11.4 | 11.4 | 22.8 | 130.0 | 110.8 | 240.8 | 27.9 | -5.1 |
| 40-b | 315 | 700 | 40 | 66 | 106 | 51.1 | 459.9 | 0 | 459.9 | 12.1 | 12.0 | 24.1 | 136.3 | 110.8 | 247.1 | 28.6 | -4.5 |

Table A-4.5 CONSTRUCTION COST (TENOM PANGI EXTENSION)

(Unit: $10^6$US$)

| | Item | Installed capacity (MW) | | |
|---|---|---|---|---|
| | | 22 | 44 | 66 |
| 1. | Preparatory work | 2.8 | 5.5 | 8.3 |
| 2. | Diversion work | 0 | 0 | 0 |
| 3. | Intake weir | 0 | 0 | 0 |
| 4. | Intake structure | 0.3 | 0.6 | 1.5 |
| 5. | Waterway/surge tank | 14.9 | 23.9 | 36.6 |
| 6. | Penstock | 1.0 | 2.0 | 2.8 |
| 7. | Powerhouse/tailrace | 2.1 | 4.3 | 6.8 |
| 8. | Switch yard | 0 | 0 | 0 |
| 9. | Gate and penstock | 3.4 | 6.8 | 10.2 |
| 10. | Generating equipment | 6.0 | 12.0 | 18.0 |
| 11. | Transmission line | 0 | 0 | 0 |
| 12. | Substation | 3.0 | 6.0 | 9.0 |
| | Subtotal: | 33.5 | 61.1 | 93.2 |
| 13. | Engineering and administration | 2.7 | 4.9 | 7.5 |
| 14. | Physical contingency | 3.6 | 6.6 | 10.1 |
| | Total: | 39.8 | 72.6 | 110.8 |

Table A-4.6 (1) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 1 - HWL: El. 290 m, V: 141 MCM, P: - MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.0 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 17.4 |
| 4. | Saddle dam | 0 |
| 5. | Spillway | 7.3 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | - |
| 8. | Waterway and surge tank | - |
| 9. | Penstock | - |
| 10. | Powerhouse and tailrace | - |
| 11. | Switch yard | - |
| 12. | Hydromechanical work | 2.5 |
| 13. | Generating equipment | - |
| 14. | Transmission line | - |
| | Sub-total | 38.6 |
| 15. | Engineering and administration | 3.1 |
| 16. | Compensation | 10.5 |
| 17. | Physical contingency | 5.2 |
| | Total | 57.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (2) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 2 - HWL: El. 300 m, V: 336 MCM, P: - MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.2 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 19.8 |
| 4. | Saddle dam | 0.2 |
| 5. | Spillway | 7.8 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | - |
| 8. | Waterway and surge tank | - |
| 9. | Penstock | - |
| 10. | Powerhouse and tailrace | - |
| 11. | Switch yard | - |
| 12. | Hydromechanical work | 2.6 |
| 13. | Generating equipment | - |
| 14. | Transmission line | - |
| | Sub-total | 42.0 |
| 15. | Engineering and administration | 3.4 |
| 16. | Compensation | 14.4 |
| 17. | Physical contingency | 6.0 |
| | Total | 65.8 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (3) CONSTTUCTION COST (SOOK RESERVOIR AND P/S)

(Case 3 - HWL: El. 310 m, V: 632 MCM, P: - MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | - |
| 8. | Waterway and surge tank | - |
| 9. | Penstock | - |
| 10. | Powerhouse and tailrace | - |
| 11. | Switch yard | - |
| 12. | Hydromechanical work | 2.7 |
| 13. | Generating equipment | - |
| 14. | Transmission line | - |
| | Sub-total | 50.2 |
| 15. | Engineering and administration | 4.0 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 7.3 |
| | Total | 79.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (4) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 4 - HWL: El. 315 m, V: 820 MCM, P: - MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 10.5 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | - |
| 8. | Waterway and surge tank | - |
| 9. | Penstock | - |
| 10. | Powerhouse and tailrace | - |
| 11. | Switch yard | - |
| 12. | Hydromechanical work | 2.8 |
| 13. | Generating equipment | - |
| 14. | Transmission line | - |
| | Sub-total | 65.4 |
| 15. | Engineering and administration | 5.2 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 9.2 |
| | Total | 100.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (5) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 5 - HWL: El. 300 m, V: 300 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.2 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 19.8 |
| 4. | Saddle dam | 0.2 |
| 5. | Spillway | 7.8 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.4 |
| 8. | Waterway and surge tank | 1.8 |
| 9. | Penstock | 0.8 |
| 10. | Powerhouse and tailrace | 1.3 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 4.0 |
| 13. | Generating equipment | 5.2 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 54.0 |
| 15. | Engineering and administration | 4.3 |
| 16. | Compensation | 14.4 |
| 17. | Physical contingency | 7.3 |
| | Total | 80.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (6) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 6 - HWL: El. 300 m, V: 300 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.2 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 19.8 |
| 4. | Saddle dam | 0.2 |
| 5. | Spillway | 7.8 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 3.0 |
| 9. | Penstock | 1.0 |
| 10. | Powerhouse and tailrace | 2.8 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.4 |
| 13. | Generating equipment | 7.9 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 61.2 |
| 15. | Engineering and administration | 4.9 |
| 16. | Compensation | 14.4 |
| 17. | Physical contingency | 8.1 |
| | Total | 88.6 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (7) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 7 - HWL: El. 300 m, V: 300 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.2 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 19.8 |
| 4. | Saddle dam | 0.2 |
| 5. | Spillway | 7.8 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.8 |
| 8. | Waterway and surge tank | 4.0 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 4.0 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.4 |
| 13. | Generating equipment | 9.7 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 66.5 |
| 15. | Engineering and administration | 5.3 |
| 16. | Compensation | 14.4 |
| 17. | Physical contingency | 8.6 |
| | Total | 94.8 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (8) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 8 - HWL: El. 300 m, V: 300 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.2 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 19.8 |
| 4. | Saddle dam | 0.2 |
| 5. | Spillway | 7.8 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.9 |
| 8. | Waterway and surge tank | 5.1 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 5.1 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.4 |
| 13. | Generating equipment | 12.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 72.2 |
| 15. | Engineering and administration | 5.8 |
| 16. | Compensation | 14.4 |
| 17. | Physical contingency | 9.2 |
| | Total | 101.6 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (9) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 9 - HWL: El. 305 m, V: 300 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.4 |
| 8. | Waterway and surge tank | 1.7 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.8 |
| 13. | Generating equipment | 5.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 56.6 |
| 15. | Engineering and administration | 4.5 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 7.8 |
| | Total | 85.3 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (10) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 10 - HWL: El. 305 m, V: 300 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 2.8 |
| 9. | Penstock | 1.0 |
| 10. | Powerhouse and tailrace | 2.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.1 |
| 13. | Generating equipment | 7.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 63.1 |
| 15. | Engineering and administration | 5.0 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 8.5 |
| | Total | 93.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (11) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 11 - HWL: El. 305 m, V: 300 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 3.8 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 3.8 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.2 |
| 13. | Generating equipment | 9.3 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 68.6 |
| 15. | Engineering and administration | 5.5 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 9.1 |
| | Total | 99.6 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (12) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 12 - HWL: El. 305 m, V: 300 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.8 |
| 8. | Waterway and surge tank | 4.8 |
| 9. | Penstock | 1.3 |
| 10. | Powerhouse and tailrace | 4.9 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.2 |
| 13. | Generating equipment | 11.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 74.1 |
| 15. | Engineering and administration | 5.9 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 9.6 |
| | Total | 106.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (13) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 13 - HWL: El. 305 m, V: 400 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.4 |
| 8. | Waterway and surge tank | 1.7 |
| 9. | Penstock | 0.8 |
| 10. | Powerhouse and tailrace | 1.3 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.9 |
| 13. | Generating equipment | 5.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 56.7 |
| 15. | Engineering and administration | 4.5 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 7.8 |
| | Total | 85.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (14) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 14 - HWL: El. 305 m, V: 400 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 2.9 |
| 9. | Penstock | 1.0 |
| 10. | Powerhouse and tailrace | 2.7 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.1 |
| 13. | Generating equipment | 7.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 63.5 |
| 15. | Engineering and administration | 5.1 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 8.5 |
| | Total | 93.5 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (15) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 15 - HWL: El. 305 m, V: 400 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 3.8 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 3.9 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.2 |
| 13. | Generating equipment | 9.4 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 68.7 |
| 15. | Engineering and administration | 5.5 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 9.1 |
| | Total | 99.7 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (16) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 16 - HWL: El. 305 m, V: 400 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.3 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 21.4 |
| 4. | Saddle dam | 1.4 |
| 5. | Spillway | 8.0 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.9 |
| 8. | Waterway and surge tank | 4.9 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 4.9 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.2 |
| 13. | Generating equipment | 11.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 74.3 |
| 15. | Engineering and administration | 5.9 |
| 16. | Compensation | 16.4 |
| 17. | Physical contingency | 9.7 |
| | Total | 106.3 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (17) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 17 - HWL: El. 310 m, V: 400 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.3 |
| 8. | Waterway and surge tank | 1.6 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.7 |
| 13. | Generating equipment | 4.7 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 61.0 |
| 15. | Engineering and administration | 4.9 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 8.4 |
| | Total | 92.7 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (18) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 18 - HWL: El. 310 m, V: 400 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 2.7 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 2.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.0 |
| 13. | Generating equipment | 7.1 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 67.6 |
| 15. | Engineering and administration | 5.4 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.1 |
| | Total | 100.5 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (19) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 19 - HWL: El. 310 m, V: 400 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 3.6 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 3.7 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.1 |
| 13. | Generating equipment | 8.8 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 72.6 |
| 15. | Engineering and administration | 5.8 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.7 |
| | Total | 106.5 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (20) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 20 - HWL: El. 310 m, V: 400 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 4.7 |
| 9. | Penstock | 1.3 |
| 10. | Powerhouse and tailrace | 4.7 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.0 |
| 13. | Generating equipment | 10.9 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 77.9 |
| 15. | Engineering and administration | 6.2 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 10.3 |
| | Total | 112.8 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (21) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 21 - HWL: El. 310 m, V: 500 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 1.6 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.8 |
| 13. | Generating equipment | 4.8 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 61.4 |
| 15. | Engineering and administration | 4.9 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 8.5 |
| | Total | 93.2 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (22) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 22 - HWL: El. 310 m, V: 500 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 2.8 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 2.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.0 |
| 13. | Generating equipment | 7.2 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 68.0 |
| 15. | Engineering and administration | 5.4 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.2 |
| | Total | 101.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (23) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 23 - HWL: El. 310 m, V: 500 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.9 |
| 8. | Waterway and surge tank | 3.7 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 3.8 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.1 |
| 13. | Generating equipment | 9.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 73.3 |
| 15. | Engineering and administration | 5.9 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.8 |
| | Total | 107.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (24) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 24 - HWL: El. 310 m, V: 500 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.9 |
| 8. | Waterway and surge tank | 4.7 |
| 9. | Penstock | 1.3 |
| 10. | Powerhouse and tailrace | 4.9 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.0 |
| 13. | Generating equipment | 11.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 78.4 |
| 15. | Engineering and administration | 6.3 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 10.3 |
| | Total | 113.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (25) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 25 - HWL: El. 310 m, V: 550 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 1.7 |
| 9. | Penstock | 0.8 |
| 10. | Powerhouse and tailrace | 1.3 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.8 |
| 13. | Generating equipment | 5.0 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 61.7 |
| 15. | Engineering and administration | 4.9 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 8.5 |
| | Total | 93.5 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (26) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 26 - HWL: El. 310 m, V: 550 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 2.9 |
| 9. | Penstock | 1.0 |
| 10. | Powerhouse and tailrace | 2.7 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 5.1 |
| 13. | Generating equipment | 7.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 68.4 |
| 15. | Engineering and administration | 5.5 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.2 |
| | Total | 101.5 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (27) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 27 - HWL: El. 310 m, V: 550 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.8 |
| 8. | Waterway and surge tank | 3.8 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 3.8 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.4 |
| 13. | Generating equipment | 9.3 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 73.8 |
| 15. | Engineering and administration | 5.9 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 9.8 |
| | Total | 107.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (28) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 28 - HWL: El. 300 m, V: 550 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.4 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 23.8 |
| 4. | Saddle dam | 3.8 |
| 5. | Spillway | 8.1 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 1.0 |
| 8. | Waterway and surge tank | 4.9 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 4.9 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 7.2 |
| 13. | Generating equipment | 11.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 79.3 |
| 15. | Engineering and administration | 6.3 |
| 16. | Compensation | 18.4 |
| 17. | Physical contingency | 10.4 |
| | Total | 114.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (29) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 29 - HWL: El. 315 m, V: 500 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.3 |
| 8. | Waterway and surge tank | 1.6 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.7 |
| 13. | Generating equipment | 4.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 78.4 |
| 15. | Engineering and administration | 6.3 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 10.6 |
| | Total | 116.4 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (30) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 30 - HWL: El. 315 m, V: 500 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 2.7 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 2.5 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 4.9 |
| 13. | Generating equipment | 6.8 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 84.7 |
| 15. | Engineering and administration | 6.8 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.3 |
| | Total | 123.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (31) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 31 - HWL: El. 315 m, V: 500 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 3.5 |
| 9. | Penstock | 1.3 |
| 10. | Powerhouse and tailrace | 3.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.0 |
| 13. | Generating equipment | 8.4 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 89.6 |
| 15. | Engineering and administration | 7.2 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.8 |
| | Total | 129.7 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (32) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 32 - HWL: El. 315 m, V: 500 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 4.5 |
| 9. | Penstock | 1.4 |
| 10. | Powerhouse and tailrace | 4.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.9 |
| 13. | Generating equipment | 10.4 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 94.7 |
| 15. | Engineering and administration | 7.6 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 12.3 |
| | Total | 135.7 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (33) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 33 - HWL: El. 315 m, V: 600 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.4 |
| 8. | Waterway and surge tank | 1.6 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.7 |
| 13. | Generating equipment | 4.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 78.6 |
| 15. | Engineering and administration | 6.3 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 10.6 |
| | Total | 116.6 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (34) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 34 - HWL: El. 315 m, V: 600 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.5 |
| 8. | Waterway and surge tank | 2.7 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 2.5 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 4.9 |
| 13. | Generating equipment | 6.8 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 84.7 |
| 15. | Engineering and administration | 6.8 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.3 |
| | Total | 123.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (35) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 35 - HWL: El. 315 m, V: 500 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 3.5 |
| 9. | Penstock | 1.3 |
| 10. | Powerhouse and tailrace | 3.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.0 |
| 13. | Generating equipment | 8.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 89.8 |
| 15. | Engineering and administration | 7.2 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.8 |
| | Total | 129.9 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (36) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 36 - HWL: El. 315 m, V: 600 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.8 |
| 8. | Waterway and surge tank | 4.5 |
| 9. | Penstock | 1.4 |
| 10. | Powerhouse and tailrace | 4.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.9 |
| 13. | Generating equipment | 10.5 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 94.9 |
| 15. | Engineering and administration | 7.6 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 12.4 |
| | Total | 136.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (37) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 37 - HWL: El. 315 m, V: 700 MCM, P: 10 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.4 |
| 8. | Waterway and surge tank | 1.6 |
| 9. | Penstock | 0.9 |
| 10. | Powerhouse and tailrace | 1.2 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 3.7 |
| 13. | Generating equipment | 4.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 78.6 |
| 15. | Engineering and administration | 6.3 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 10.6 |
| | Total | 116.6 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (38) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 38 - HWL: El. 315 m, V: 700 MCM, P: 20 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.6 |
| 8. | Waterway and surge tank | 2.7 |
| 9. | Penstock | 1.1 |
| 10. | Powerhouse and tailrace | 2.5 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 4.9 |
| 13. | Generating equipment | 6.9 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 84.9 |
| 15. | Engineering and administration | 6.8 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.3 |
| | Total | 124.1 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (39) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 39 - HWL: El. 315 m, V: 700 MCM, P: 30 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.7 |
| 8. | Waterway and surge tank | 3.6 |
| 9. | Penstock | 1.2 |
| 10. | Powerhouse and tailrace | 3.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.0 |
| 13. | Generating equipment | 8.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 89.9 |
| 15. | Engineering and administration | 7.2 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 11.8 |
| | Total | 130.0 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.6 (40) CONSTRUCTION COST (SOOK RESERVOIR AND P/S)

(Case 40 - HWL: El. 315 m, V: 700 MCM, P: 40 MW)

(Unit: $10^6$ US$)

| | Item | Amount |
|---|---|---|
| 1. | Preparatory work | 3.5 |
| 2. | Diversion work | 8.0 |
| 3. | Main dam | 31.6 |
| 4. | Saddle dam | 13.0 |
| 5. | Spillway | 8.6 |
| 6. | River outlet work | 0.4 |
| 7. | Intake structure | 0.9 |
| 8. | Waterway and surge tank | 4.6 |
| 9. | Penstock | 1.4 |
| 10. | Powerhouse and tailrace | 4.6 |
| 11. | Switch yard | 0.1 |
| 12. | Hydromechanical work | 6.9 |
| 13. | Generating equipment | 10.6 |
| 14. | Transmission line | 1.0 |
| | Sub-total | 95.2 |
| 15. | Engineering and administration | 7.6 |
| 16. | Compensation | 21.1 |
| 17. | Physical contingency | 12.4 |
| | Total | 136.3 |
| 18. | Price contingency | |
| | Grand total | |

Table A-4.7(1) POWER SCHEME (CASE 1)

| | Item | Diesel | Oil-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | --- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 130 |
| 4. | Construction period (yr) | 2 | 4 | --- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 13,760 | 114,620 | 128,380 |
| 6. | Annual capital cost ($10^3$ US$) | 1,720 | 12,630 | 14,350 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.051 | 0.058 | --- |
| 9. | Annual fuel cost ($10^3$ US$) | 860 | 38,650 | 39,510 |
| 10. | Annual OMR costs in % of installation cost | 4.0 | 2.5 | --- |
| 11. | Annual OMR costs ($10^3$ US$) | 550 | 2,870 | 3,420 |
| 12. | Total annual cost ($10^3$ US$) | 3,130 | 54,150 | 57,280 |
| 13. | Unit cost of energy output (US$/kWh) | --- | --- | 0.084 |

Table A-4.7(2) POWER SCHEME (CASE 2)

| | Item | Gas turbine | Oil-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | -- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 130 |
| 4. | Construction period (yr) | 2 | 4 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 7,320 | 114,620 | 121,940 |
| 6. | Annual capital cost ($10^3$ US$) | 860 | 12,630 | 13,490 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.122 | 0.058 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 2,060 | 38,650 | 40,710 |
| 10. | Annual OMR costs in % of installation cost | 2.0 | 2.5 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 150 | 2,870 | 3,020 |
| 12. | Total annual cost ($10^3$ US$) | 3,070 | 54,150 | 57,220 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | 0.084 |

Table A-4.7(3) POWER SCHEME (CASE 3)

| | Item | Diesel | Coal-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | -- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 130 |
| 4. | Construction period (yr) | 2 | 4 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 13,760 | 185,900 | 199,660 |
| 6. | Annual capital cost ($10^3$ US$) | 1,720 | 20,490 | 22,210 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.051 | 0.025 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 860 | 16,660 | 17,520 |
| 10. | Annual OMR costs in % of installation cost | 4.0 | 3.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 550 | 5,580 | 6,130 |
| 12. | Total annual cost ($10^3$ US$) | 3,130 | 42,730 | 45,860 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | 0.067 |

Table A-4.7(4) POWER SCHEME (CASE 4)

| | Item | Gas turbine | Coal-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | -- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 140 |
| 4. | Construction period (yr) | 2 | 4 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 7,320 | 185,900 | 193,220 |
| 6. | Annual capital cost ($10^3$ US$) | 860 | 20,490 | 21,350 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.122 | 0.025 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 2,060 | 16,660 | 18,720 |
| 10. | Annual OMR costs in % of installation cost | 2.0 | 3.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 150 | 5,580 | 5,730 |
| 12. | Total annual cost ($10^3$ US$) | 3,070 | 42,730 | 45,800 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | 0.067 |

Table A-4.7(5) POWER SCHEME (CASE 5)

| | Item | Diesel | Hydro | Gas turbine | Total |
|---|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | Backup | -- |
| 2. | Nos. of unit x capacity | 2x10MW | 2x55MW | 1x6MW | -- |
| 3. | Power generation (MW) | 20 | 106 | (6) | 130 |
| 4. | Construction period (yr) | 2 | 5 | 2 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 13,760 | 283,100 | 2,200 | 299,060 |
| 6. | Annual capital cost ($10^3$ US$) | 1,720 | 28,560 | 260 | 30,540 |
| 7. | Energy output (GWh/year) | 16.9 | 615.3 | 51.1 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.051 | 0 | 0.122 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 860 | 0 | 6,230 | 7,090 |
| 10. | Annual OMR costs in % of installation cost | 4.0 | 1.5 | 2.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 550 | 4,250 | 40 | 4,840 |
| 12. | Total annual cost ($10^3$ US$) | 3,130 | 32,810 | 6,530 | 42,470 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | -- | 0.062 |

Table A-4.7(6) POWER SCHEME (CASE 6)

| | Item | Gas turbine | Hydro | Gas turbine | Total |
|---|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | Backup | -- |
| 2. | Nos. of unit x capacity | 2x10MW | 2x55MW | 1x6MW | -- |
| 3. | Power generation (MW) | 20 | 106 | (6) | 130 |
| 4. | Construction period (yr) | 2 | 5 | 2 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 7,320 | 283,100 | 2,200 | 292,620 |
| 6. | Annual capital cost ($10^3$ US$) | 860 | 28,560 | 260 | 29,680 |
| 7. | Energy output (GWh/year) | 16.9 | 615.3 | 51.1 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0.122 | 0 | 0.122 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 2,060 | 0 | 6,230 | 8,290 |
| 10. | Annual OMR costs in % of installation cost | 2.0 | 1.5 | 2.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 150 | 4,250 | 40 | 4,440 |
| 12. | Total annual cost ($10^3$ US$) | 3,070 | 32,810 | 6,530 | 42,410 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | -- | 0.062 |

Table A-4.7(7) POWER SCHEME (CASE 7)

| | Item | Hydro | Oil-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | -- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 130 |
| 4. | Construction period (yr) | 5 | 4 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 101,500 | 114,620 | 216,120 |
| 6. | Annual capital cost ($10^3$ US$) | 10,240 | 12,630 | 22,870 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0 | 0.058 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 0 | 38,650 | 38,650 |
| 10. | Annual OMR costs in % of installation cost | 1.5 | 2.5 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 1,520 | 2,870 | 4,390 |
| 12. | Total annual cost ($10^3$ US$) | 11,760 | 54,150 | 65,910 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | 0.096 |

Table A-4.7(8) POWER SCHEME (CASE 8)

| | Item | Hydro | Coal-fired thermal | Total |
|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | -- |
| 2. | Nos. of unit x capacity | 2 x 10 MW | 2 x 55 MW | |
| 3. | Power generation (MW) | 20 | 110 | 130 |
| 4. | Construction period (yr) | 5 | 4 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 101,500 | 185,900 | 287,400 |
| 6. | Annual capital cost ($10^3$ US$) | 10,240 | 20,490 | 30,730 |
| 7. | Energy output (GWh/year) | 16.9 | 666.4 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0 | 0.025 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 0 | 16,660 | 16,660 |
| 10. | Annual OMR costs in % of installation cost | 1.5 | 3.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 1,520 | 5,580 | 7,100 |
| 12. | Total annual cost ($10^3$ US$) | 11,760 | 42,730 | 54,490 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | 0.080 |

Table A-4.7(9) POWER SCHEME (CASE 9)

| | Item | Hydro | Hydro | Gas turbine | Total |
|---|---|---|---|---|---|
| 1. | Allocation | Peak load | Base load | Backup | -- |
| 2. | Nos. of unit x capacity | 2x10MW | 2x55MW | 1x14MW | -- |
| 3. | Power generation (MW) | 10 | 106 | (14) | 130 |
| 4. | Construction period (yr) | 5 | 5 | 2 | -- |
| 5. | Installation cost, adjusted ($10^3$ US$) | 101,500 | 203,200 | 5,120 | 309,820 |
| 6. | Annual capital cost ($10^3$ US$) | 10,240 | 20,500 | 600 | 31,340 |
| 7. | Energy output (GWh/year) | 14.3 | 646.5 | 22.5 | 683.3 |
| 8. | Fuel cost, adjusted (US$/kWh) | 0 | 0 | 0.122 | -- |
| 9. | Annual fuel cost ($10^3$ US$) | 0 | 0 | 2,750 | 2,750 |
| 10. | Annual OMR costs in % of installation cost | 1.5 | 1.5 | 2.0 | -- |
| 11. | Annual OMR costs ($10^3$ US$) | 1,520 | 3,050 | 100 | 4,670 |
| 12. | Total annual cost ($10^3$ US$) | 11,760 | 23,550 | 3,450 | 38,760 |
| 13. | Unit cost of energy output (US$/kWh) | -- | -- | -- | 0.057 |

Table A-7.1(1) PROJECT COST FOR SOOK DAM AND POWER STATION

| | Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|---|
| 1. | Preparatory Work | | | | | |
| 1) | Access and haul roads | L.S. | | | 1,000,000 | |
| 2) | Office, workshop, quarters, etc. | L.S. | | | 1,000,000 | |
| 3) | Water supply system | L.S. | | | 100,000 | |
| 4) | Power supply system | L.S. | | | 1,000,000 | |
| 5) | Telecommunication | L.S. | | | 100,000 | |
| 6) | Miscellaneous | L.S. | | | 160,000 | 5% of 1) to 5) |
| | Sub-total | | | | 3,360,000 | |
| 2. | River Diversion Work | | | | | |
| 1) | Excavation in common | $m^3$ | 55,000 | 4.0 | 220,000 | |
| 2) | " in weathered rock | $m^3$ | 4,000 | 8.0 | 32,000 | |
| 3) | " in rock | $m^3$ | 1,000 | 12.0 | 12,000 | |
| 4) | " in tunnel | $m^3$ | 45,000 | 70.0 | 3,150,000 | |
| 5) | Concrete in open | $m^3$ | 1,800 | 120.0 | 216,000 | |
| 6) | " in tunnel | $m^3$ | 17,000 | 160.0 | 2,720,000 | |
| 7) | Reinforcement bars | ton | 480 | 750.0 | 360,000 | |
| 8) | Grouting, consolidation | ton | 1,000 | 700.0 | 700,000 | |
| 9) | Care of river | L.S. | | | 200,000 | |
| 10) | Miscellaneous works | L.S. | | | 381,000 | 5% of 1) to 9) |
| | Sub-total | | | | 7,991,000 | |

Table A-7.1(2) PROJECT COST FOR SOOK DAM AND POWER STATION

| | Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|---|
| 3. | Main Dam | | | | | |
| 1) | Excavation in common | $m^3$ | 580,000 | 4.0 | 2,320,000 | |
| 2) | " in weathered rock | $m^3$ | 32,000 | 8.0 | 256,000 | |
| 3) | " in in rock | $m^3$ | 30,000 | 12.0 | 360,000 | |
| 4) | Embankment in impervious core | $m^3$ | 240,000 | 8.0 | 1,920,000 | |
| 5) | " in filter | $m^3$ | 190,000 | 13.0 | 2,280,000 | |
| 6) | " in rock | $m^3$ | 1,300,000 | 8.0 | 10,400,000 | |
| 7) | Concrete in open | $m^3$ | 6,800 | 120.0 | 816,000 | |
| 8) | Reinforcement bars | ton | 410 | 750.0 | 308,000 | |
| 9) | Grouting, curtain | m | 26,000 | 110.0 | 2,860,000 | |
| 10) | " , blanket | m | 8,000 | 110.0 | 880,000 | |
| 11) | Shotcrete | $m^2$ | 6,000 | 45.0 | 270,000 | |
| 12) | Miscellaneous works | L.S. | | | 1,134,000 | 5% of 1) to 11) |
| | Sub-total | | | | 23,804,000 | |
| 4. | Saddle Dam | | | | | |
| 1) | Excavation in common | $m^3$ | 90,000 | 4.0 | 360,000 | |
| 2) | Embankment in impervious core | $m^3$ | 220,000 | 8.0 | 1,760,000 | |
| 3) | " in filter | $m^3$ | 35,000 | 13.0 | 455,000 | |
| 4) | " in rock | $m^3$ | 115,000 | 8.0 | 920,000 | |
| 5) | Miscellaneous works | L.S. | | | 300,000 | 5% of 1) to 4) |
| | Sub-total | | | | 3,795,000 | |

Table A-7.1(3) PROJECT COST FOR SOOK DAM AND POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 5. Spillway | | | | | |
| 1) Excavation in common | $m^3$ | 250,000 | 4.0 | 1,000,000 | |
| 2) " in weathered rock | $m^3$ | 80,000 | 8.0 | 640,000 | |
| 3) " in rock | $m^3$ | 50,000 | 12.0 | 600,000 | |
| 4) Concrete in open | $m^3$ | 35,000 | 120.0 | 4,200,000 | |
| 5) Reinforcement bars | ton | 1,400 | 750.0 | 1,050,000 | |
| 6) Shotcrete | $m^2$ | 6,000 | 45.0 | 270,000 | |
| 7) Miscellaneous works | L.S. | | | 350,000 | 5% of 1) to 6) |
| Sub-total | | | | 8,110,000 | |
| 6. River Outlet Work | | | | | |
| 1) Excavation in tunnel | $m^3$ | 300 | 70.0 | 20,000 | |
| 2) Concrete in tunnel | $m^3$ | 2,000 | 120.0 | 240,000 | |
| 3) Reinforcement bar | ton | 80 | 750.0 | 60,000 | |
| 4) Metal work | ton | 50 | 2,000.0 | 100,000 | |
| 5) Miscellaneous works | L.S. | | | 21,000 | 5% of 1) to 4) |
| Sub-total | | | | 441,000 | |
| 7. Intake Structure | | | | | |
| 1) Excavation in common | $m^3$ | 35,000 | 4.0 | 140,000 | |
| 2) " in weathered rock | $m^3$ | 13,000 | 8.0 | 104,000 | |
| 3) " in rock | $m^3$ | 5,000 | 12.0 | 60,000 | |
| 4) Concrete in open | $m^3$ | 2,000 | 120.0 | 240,000 | |

Table A-7.1(4) PROJECT COST FOR SOOK DAM AND POWER STATION

| | Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|---|
| 5) | Reinforcement bars | ton | 100 | 750.0 | 75,000 | |
| 6) | Miscellaneous works | L.S. | | | 30,000 | 5% of 1) to 5) |
| | Sub-total | | | | 649,000 | |
| 8. | Waterway and Surge Tank | | | | | |
| 1) | Excavation in common | $m^3$ | 40,000 | 4.0 | 160,000 | |
| 2) | " in weathered rock | $m^3$ | 2,000 | 8.0 | 16,000 | |
| 3) | " in tunnel | $m^3$ | 12,000 | 70.0 | 840,000 | |
| 4) | " in shaft | $m^3$ | 8,500 | 85.0 | 723,000 | |
| 5) | Concrete in tunnel | $m^3$ | 3,500 | 160.0 | 560,000 | |
| 6) | " in shaft | $m^3$ | 1,000 | 160.0 | 160,000 | |
| 7) | Reinforcement bars | ton | 320 | 750.0 | 240,000 | |
| 8) | Grouting, consolidation | ton | 70 | 700.0 | 49,000 | |
| 9) | Miscellaneous works | L.S. | | | 137,000 | 5% of 1) to 8) |
| | Sub-total | | | | 2,885,000 | |
| | | | | | 2,885,000 | |
| 9. | Penstock Line | | | | | |
| 1) | Excavation in common | $m^3$ | 15,000 | 4.0 | 90,000 | |
| 2) | " in weathered rock | $m^3$ | 12,000 | 8.0 | 96,000 | |
| 3) | " in rock | $m^3$ | 20,000 | 12.0 | 240,000 | |
| 4) | " in tunnel | $m^3$ | 1,000 | 70.0 | 70,000 | |
| 5) | Concrete in open | $m^3$ | 2,000 | 120.0 | 240,000 | |
| 6) | " in tunnel | $m^3$ | 400 | 160.0 | 64,000 | |

Table A-7.1(5) PROJECT COST FOR SOOK DAM AND POWER STATION

| | Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|---|
| 7) | Reinforcement | ton | 240 | 750.0 | 180,000 | |
| 8) | Miscellaneous work | L.S. | | | 49,000 | 5% of 1) to 8) |
| | Sub-total | | | | 1,029,000 | |
| 10. | Powerhouse and Tailrace | | | | | |
| 1) | Excavation in common | $m^3$ | 4,000 | 4.0 | 16,000 | |
| 2) | " in weathered rock | $m^3$ | 6,000 | 8.0 | 48,000 | |
| 3) | " in rock | $m^3$ | 23,000 | 12.0 | 276,000 | |
| 4) | Concrete in open | $m^3$ | 8,500 | 120.0 | 1,020,000 | |
| 5) | Reinforcement bars | ton | 450 | 750.0 | 338,000 | |
| 6) | Powerhouse superstructure | L.S. | | | 850,000 | |
| 7) | Miscellaneous works | L.S. | | | 127,000 | 5% of 1) to 6) |
| | Sub-total | | | | 2,675,000 | |
| 11. | Switch Yard | | | | | |
| 1) | Excavation in common | $m^3$ | 1,000 | 4.0 | 4 000 | |
| 2) | Embankment in earth materials | $m^3$ | 1,000 | 8.0 | 8,000 | |
| 3) | Concrete in open | $m^3$ | 500 | 120.0 | 60,000 | |
| 4) | Reinforcement bars | ton | 20 | 750.0 | 15,000 | |
| 5) | Miscellaneous works | L.S. | | | 4,000 | 5% of 1) to 4) |
| | Sub-total | | | | 91,000 | |

Table A-7.1(6) PROJECT COST FOR SOOK DAM AND POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 12.Hydro-mechanical Works | | | | | |
| 1) Diversion gate | ton | 60 | 3,800 | 228,000 | |
| 2) Spillway gate | ton | 180 | 7,000 | 1,260,000 | |
| 3) River outlet facilities | ton | 70 | 8,000 | 560,000 | |
| 4) Trash rack for river outlet | ton | 30 | 3,500 | 105,000 | |
| 5) Intake gate | ton | 100 | 7,000 | 700,000 | |
| 6) Intake trash rack | ton | 60 | 3,500 | 210,000 | |
| 7) Intake mechanical race | L.S. | | | 300,000 | |
| 8) Steel penstock | ton | 240 | 3,600 | 864,000 | |
| 9) Tailrace gate | ton | 60 | 6,500 | 390,000 | |
| 10) Floating trash removing facilities | L.S. | | | 500,000 | |
| Sub-total | | | | 5,117,000 | |
| 13.Generating Equipment | L.S. | | | 7,500,000 | 10 MW x 2 sets |
| 14.Transmission Line | Km | 10 | 100,000 | 1,000,000 | Sook - Keningau |
| 15.Total of Items 1. to 14. | | | | 68,447,000 | |
| 16.Engineering and Administration | L.S. | | | 5,476,000 | 8% of Item 15. |
| 17.Compensation | L.S. | | | 18,400,000 | |
| 18.Physical Contingency | L.S. | | | 9,232,000 | 10% of Items 15. to 17. |

Table A-7.1(7) PROJECT COST FOR SOOK DAM AND POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 19. Total of Items 1. to 18. | | | | 101,555,000 | |
| 20. Price Contingency | | | | 40,645,000 | |
| 21. Grand Total | | | | 142,200,000 | |

Table A-7.2(1) PROJECT COST FOR EXTENSION OF TENOM PANGI POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 1. Preparatory Work | | | | | |
| 1) Office, workshop, quarters, etc. | L.S. | | | 1,000,000 | |
| 2) Water supply system | L.S. | | | 100,000 | |
| 3) Power supply system | L.S. | | | 4,000,000 | |
| 4) Telecommunication system | L.S. | | | 100,000 | |
| 5) Miscellaneous | L.S. | | | 260,000 | 5% of 1) to 5) |
| Sub-total | | | | 5,460,000 | |
| 2. Intake Structure | | | | | |
| 1) Care of river | L.S. | | | 300,000 | |
| 2) Miscellaneous works | L.S. | | | 300,000 | |
| Sub-total | | | | 600,000 | |
| 3. Waterway and Surge Tank | | | | | |
| 1) Excavation in tunnel | $m^3$ | 145,000 | 70.0 | 10,150,000 | |
| 2) " in shaft | $m^3$ | 19,000 | 85.0 | 1,615,000 | |
| 3) Concrete in tunnel | $m^3$ | 45,000 | 160.0 | 7,200,000 | |
| 4) " in shaft | $m^3$ | 5,000 | 160.0 | 800,000 | |
| 5) Reinforcement bars | ton | 2,000 | 750.0 | 1,500,000 | |
| 6) Grouting, consolidation | ton | 2,100 | 700.0 | 1,470,000 | |
| 7) Miscellaneous works | | | | 1,137,000 | 5% of 1 to 6) |
| Sub-total | | | | 23,872,000 | |

Table A-7.2(2) PROJECT COST FOR EXTENSION OF TENOM PANGI POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 4. Penstock Line | | | | | |
| 1) Excavation in tunnel | $m^3$ | 13,000 | 70.0 | 910,000 | |
| 2) Concrete in tunnel | $m^3$ | 5,000 | 160.0 | 800,000 | |
| 3) Reinforcing bars | ton | 200 | 750.0 | 150,000 | |
| 4) Grouting, consolidation | ton | 60 | 700.0 | 42,000 | |
| 5) Miscellaneous works | | | | 95,000 | 5% of 1) to 4) |
| Sub-total | | | | 1,997,000 | |
| 5. Powerhouse and Tailrace | | | | | |
| 1) Excavation in common | $m^3$ | 70,000 | 4.0 | 280,000 | |
| 2) " in weathered rock | $m^3$ | 20,000 | 8.0 | 160,000 | |
| 3) " in rock | $m^3$ | 10,000 | 12.0 | 120,000 | |
| 4) Concrete in open | $m^3$ | 15,000 | 120.0 | 1,800,000 | |
| 5) Reinforcement bars | $m^3$ | 900 | 750.0 | 675,000 | |
| 6) Powerhouse superstructure | L.S. | | | 1,100,000 | |
| 7) Miscellaneous works | | | | 207,000 | 5% of 1) to 6) |
| Sub-total | | | | 4,342,000 | |

Table A-7.2(3) PROJECT COST FOR EXTENSION OF TENOM PANGI POWER STATION

| Work Item | Unit | Quantity | Unit Price (US$) | Amount (US$) | Remarks |
|---|---|---|---|---|---|
| 6. Hydro-mechanical Works | | | | | |
| 1) Intake trash rack | ton | 34 | 3,800 | 171,000 | |
| 2) Intake gate | ton | 150 | 7,000 | 1,050,000 | |
| 3) Floating trash deflector | ton | 200 | 5,000 | 1,000,000 | |
| 4) Mechanical rake | L.S. | | | 1,500,000 | |
| 5) Steel penstock | ton | 700 | 3,600 | 2,520,000 | |
| 6) Tailrace gate | ton | 40 | 6,500 | 260,000 | |
| 7) Miscellaneous works | | | | 325,000 | 5% of 1) to 6) |
| Sub-total | | | | 6,826,000 | |
| 7. Generating Equipment | L.S. | | | 12,000,000 | 22 MW x 2 units |
| 8. Substation Equipment | L.S. | | | 6,000,000 | |
| 9. Total of Items 1. to 8. | | | | 61,097,000 | |
| 10. Engineering and Administration | L.S. | | | 4,888,000 | 8% of Item 9. |
| 11. Compensation | | | | - | |
| 12. Physical Contingency | L.S. | | | 6,599,000 | 10% of Items 9. to 11. |
| 13. Total of Items 9. to 12. | | | | 72,584,000 | |
| 14. Price Contingency | | | | 29,016,000 | |
| 15. Grand Total | | | | 101,600,000 | |

Table A-8.1 DISBURSEMENT SCHEDULE OF ECONOMIC COST (SOOK DAM AND POWER STATION + TENOM PANGI EXTENSION - PHASE III ONLY)

(Unit: $10^3$ US$)

| Item | Total Amount | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| I. Total economic cost | | | | | | |
| 1. Sook dam and power station | 76,185 | 5,154 | 15,134 | 13,205 | 24,420 | 18,272 |
| 2. Tenom Pangi extension | 68,875 | 2,151 | 6,449 | 11,854 | 27,079 | 21,342 |
| 3. Total | 145,060 | 7,305 | 21,583 | 25,059 | 51,499 | 39,614 |
| II. Foreign currency portion | | | | | | |
| 1. Sook dam and power station | 47,127 | 2,841 | 8,559 | 7,301 | 15,141 | 13,285 |
| 2. Tenom Pangi extension | 49,071 | 1,760 | 2,278 | 8,066 | 20,373 | 16,594 |
| 3. Total | 96,198 | 4,601 | 10,837 | 15,367 | 35,514 | 29,879 |
| III. Local currency portion | | | | | | |
| 1. Sook dam and power station | 29,058 | 2,313 | 6,575 | 5,304 | 9,279 | 4,987 |
| 2. Tenom Pangi extension | 19,804 | 391 | 4,171 | 3,788 | 6,706 | 4,748 |
| 3. Total | 48,862 | 2,704 | 10,746 | 9,692 | 15,985 | 9,735 |

Table A-8.2 (1) DISBURSEMENT SCHEDULE OF ECONOMIC COST (TOTAL) OF SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 2,927 | - | 1,755 | 1,172 | - | - | - |
| 2. | River Diversion Work | 7,514 | - | 417 | 4,591 | 834 | - | 1,672 |
| 3. | Main Dam | 21,923 | - | - | 3,372 | 5,901 | 10,118 | 2,532 |
| 4. | Saddle Dam | 3,509 | - | 218 | 2,631 | 660 | - | - |
| 5. | Spillway | 7,341 | - | - | 1,375 | 2,752 | 2,752 | 462 |
| 6. | River Outlet Work | 410 | - | - | - | 204 | - | 206 |
| 7. | Intake Structure | 590 | - | - | - | 196 | 394 | - |
| 8. | Waterway and Surge Tank | 2,701 | - | - | - | - | 1,413 | 1,288 |
| 9. | Penstock Line | 939 | - | - | - | 520 | 419 | - |
| 10. | Powerhouse and Tailrace | 2,404 | - | - | - | 73 | 1,108 | 1,223 |
| 11. | Switch Yard | 82 | - | - | - | - | - | 82 |
| 12. | Hydro-mechanical Works | 4,953 | - | - | - | - | 2,567 | 2,386 |
| 13. | Generating Equipment | 7,380 | - | - | - | 388 | 2,329 | 4,663 |
| 14. | Transmission Line | 976 | - | - | - | - | - | 976 |
| 15. | Sub-total | 63,649 | - | 2,390 | 13,141 | 11,528 | 21,100 | 15,490 |
| 16. | Engineering and Administration | 5,356 | - | 2,296 | 618 | 478 | 1,101 | 863 |
| 17. | Compensation | - | - | - | - | - | - | - |
| 18. | Physical Contingency | 7,180 | - | 468 | 1,375 | 1,199 | 2,219 | 1,919 |
| 19. | Total | 76,185 | - | 5,154 | 15,134 | 13,205 | 24,420 | 18,272 |

Table A-8.2 (2) DISBURSEMENT SCHEDULE OF ECONOMIC COST (FOREIGN CURRENCY PORTION) SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 651 | - | 390 | 261 | - | - | - |
| 2. | River Diversion Work | 5,010 | - | 278 | 3,061 | 556 | - | 1,115 |
| 3. | Main Dam | 12,049 | - | - | 1,853 | 3,243 | 5,561 | 1,392 |
| 4. | Saddle Dam | 2,009 | - | 125 | 1,506 | 378 | - | - |
| 5. | Spillway | 3,305 | - | - | 619 | 1,239 | 1,239 | 208 |
| 6. | River Outlet Work | 249 | - | - | - | 124 | - | 125 |
| 7. | Intake Structure | 277 | - | - | - | 92 | 185 | - |
| 8. | Waterway and Surge Tank | 1,737 | - | - | - | - | 909 | 828 |
| 9. | Penstock Line | 464 | - | - | - | 257 | 207 | - |
| 10. | Powerhouse and Tailrace | 983 | - | - | - | 30 | 453 | 500 |
| 11. | Switch Yard | 34 | - | - | - | - | - | 34 |
| 12. | Hydro-mechanical Works | 4,094 | - | - | - | - | 2,122 | 1,972 |
| 13. | Generating Equipment | 6,750 | - | - | - | 355 | 2,131 | 4,264 |
| 14. | Transmission Line | 850 | - | - | - | - | - | 850 |
| 15. | Sub-total | 38,462 | - | 793 | 7,300 | 6,274 | 12,807 | 11,288 |
| 16. | Engineering and Administration | 4,381 | - | 1,790 | 481 | 364 | 958 | 788 |
| 17. | Compensation | - | - | - | - | - | - | - |
| 18. | Physical Contingency | 4,284 | - | 258 | 778 | 663 | 1,376 | 1,209 |
| 19. | Total | 47,127 | - | 2,841 | 8,559 | 7,301 | 15,141 | 13,285 |

Table A-8.2 (3) DISBURSEMENT SCHEDULE OF ECONOMIC COST (LOCAL CURRENCY PORTION) SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 2,276 | - | 1,365 | 911 | - | - | - |
| 2. | River Diversion Work | 2,504 | - | 139 | 1,530 | 278 | - | 557 |
| 3. | Main Dam | 9,874 | - | - | 1,519 | 2,658 | 4,557 | 1,140 |
| 4. | Saddle Dam | 1,500 | - | 93 | 1,125 | 282 | - | - |
| 5. | Spillway | 4,036 | - | - | 756 | 1,513 | 1,513 | 254 |
| 6. | River Outlet Work | 161 | - | - | - | 80 | - | 81 |
| 7. | Intake Structure | 313 | - | - | - | 104 | 209 | - |
| 8. | Waterway and Surge Tank | 964 | - | - | - | - | 504 | 460 |
| 9. | Penstock Line | 475 | - | - | - | 263 | 212 | - |
| 10. | Powerhouse and Tailrace | 1,421 | - | - | - | 43 | 655 | 723 |
| 11. | Switch Yard | 48 | - | - | - | - | - | 48 |
| 12. | Hydro-mechanical Works | 859 | - | - | - | - | 445 | 414 |
| 13. | Generating Equipment | 630 | - | - | - | 33 | 198 | 399 |
| 14. | Transmission Line | 126 | - | - | - | - | - | 126 |
| 15. | Sub-total | 25,187 | - | 1,597 | 5,841 | 5,254 | 8,293 | 4,202 |
| 16. | Engineering and Administration | 975 | - | 506 | 137 | 114 | 143 | 75 |
| 17. | Compensation | - | - | - | - | - | - | - |
| 18. | Physical Contingency | 2,896 | - | 210 | 597 | 536 | 843 | 710 |
| 19. | Total | 29,058 | - | 2,313 | 6,575 | 5,904 | 9,279 | 4,987 |

Table A-8.3 (1) DISBURSEMENT SCHEDULE OF ECONOMIC COST (TOTAL) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 4,808 | | | 4,808 | | | |
| 2. | Intake Structures | 538 | | | | 179 | 179 | 180 |
| 3. | Waterway & Surge Tank | 22,534 | | | 866 | 5,488 | 10,110 | 6,070 |
| 4. | Penstock Line | 1,886 | | | | 664 | 664 | 558 |
| 5. | Powerhouse & Tailrace | 3,893 | | | | 1,668 | 1,389 | 836 |
| 6. | Hydro-Mechanical Works | 6,608 | | | | 600 | 3,603 | 2,405 |
| 7. | Generating Equipment | 11,712 | | | | 557 | 4,461 | 6,694 |
| 8. | Substation Equipment | 5,856 | | | | 1,171 | 2,928 | 1,757 |
| 9. | Sub-Total | 57,835 | 0 | 0 | 5,674 | 10,327 | 23,334 | 18,500 |
| 10. | Engineering & Administration | 4,779 | 0 | 1,956 | 189 | 450 | 1,284 | 900 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 6,261 | 0 | 195 | 586 | 1,077 | 2,461 | 1,942 |
| 13. | Total | 68,875 | 0 | 2,151 | 6,449 | 11,854 | 27,079 | 21,342 |

Table A-8.3 (2) DISBURSEMENT SCHEDULE OF ECONOMIC COST (FOREIGN CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 1,386 | | | 1,386 | | | |
| 2. | Intake Structures | 210 | | | | 70 | 70 | 70 |
| 3. | Waterway & Surge Tank | 15,513 | | | 596 | 3,778 | 6,960 | 4,179 |
| 4. | Penstock Line | 1,306 | | | | 460 | 460 | 386 |
| 5. | Powerhouse & Tailrace | 1,534 | | | | 657 | 547 | 330 |
| 6. | Hydro-Mechanical Works | 5,461 | | | | 496 | 2,978 | 1,987 |
| 7. | Generating Equipment | 10,200 | | | | 485 | 3,885 | 5,830 |
| 8. | Substation Equipment | 5,100 | | | | 1,020 | 2,550 | 1,530 |
| 9. | Sub-Total | 40,710 | 0 | 0 | 1,982 | 6,966 | 17,450 | 14,312 |
| 10. | Engineering & Administration | 3,900 | 0 | 1,600 | 89 | 367 | 1,071 | 773 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 4,461 | 0 | 160 | 207 | 733 | 1,852 | 1,509 |
| 13. | Total | 49,071 | 0 | 1,760 | 2,278 | 8,066 | 20,373 | 16,594 |

Table A-8.3 (3) DISBURSEMENT SCHEDULE OF ECONOMIC COST (LOCAL CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 3,422 | | | 3,422 | | | |
| 2. | Intake Structures | 328 | | | | 109 | 109 | 109 |
| 3. | Waterway & Surge Tank | 7,021 | | | 270 | 1,710 | 3,150 | 1,891 |
| 4. | Penstock Line | 580 | | | | 204 | 204 | 172 |
| 5. | Powerhouse & Tailrace | 2,359 | | | | 1,011 | 842 | 506 |
| 6. | Hydro-Mechanical Works | 1,147 | | | | 104 | 625 | 418 |
| 7. | Generating Equipment | 1,512 | | | | 72 | 576 | 864 |
| 8. | Substation Equipment | 756 | | | | 151 | 378 | 227 |
| 9. | Sub-Total | 17,125 | 0 | 0 | 3,692 | 3,361 | 5,884 | 4,187 |
| 10. | Engineering & Administration | 879 | 0 | 356 | 100 | 83 | 213 | 127 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 1,800 | 0 | 35 | 379 | 344 | 609 | 433 |
| 13. | Total | 19,804 | 0 | 391 | 4,171 | 3,788 | 6,706 | 4,747 |

Table A-8.4 POWER BENEFIT (PHASE III ONLY)

| No. | Year | Power generated (MW) | Energy output (GWh) | | | Power benefit ($10^6$ US$) | | | Present worth factor | Present worth ($10^6$ US$) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Firm | Dump | Total | Capacity | Energy | Total | | |
| 1 | 1989 | | | | | | | | 0.9091 | |
| 2 | 1990 | | | | | | | | 0.8264 | |
| 3 | 1991 | | | | | | | | 0.7513 | |
| 4 | 1992 | | | | | | | | 0.6830 | |
| 5 | 1993 | | | | | | | | 0.6209 | |
| 6 | 1994 | 41.0 | 329.3 | 6.3 | 335.6 | 9.7 | 8.6 | 18.3 | 0.5645 | 10.3 |
| 7 | 1995 | 61.0 | 329.3 | 6.3 | 335.6 | 14.5 | 8.6 | 23.1 | 0.5132 | 11.9 |
| 8 | 1996 | 71.0 | 329.3 | 6.3 | 335.6 | 16.8 | 8.6 | 25.4 | 0.4665 | 11.8 |
| 9 | 1997 | 71.0 | 329.3 | 6.3 | 335.6 | 16.8 | 8.6 | 25.4 | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | 25.4 x 9.8969 x 0.5132 = 129.0 | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| . | . | | | | | | | | | |
| 55 | 2043 | 71.0 | 329.3 | 6.3 | 335.6 | 16.8 | 8.6 | 25.4 | 0.0053 | 0.1 |
| Total: | | | | | | | | | | 163.0 |

Annual equivalent benefit: 163.0 x 0.1009 = 16.4 x $10^6$ US$

Table A-8.5 POWER BENEFIT (PHASES I, II AND III)

| No. | Year | Power generated (MW) | | | Energy output (GWh) | | | | | | | | | Power benefit ($10^6$ US$) | | | Present worth factor | Present worth ($10^6$ US$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Phase I, II | | | Phase III | | | Grand total | | | | | | | |
| | | Phase I, II | Phase III | Total | Firm | Dump | Total | Firm | Dump | Total | Firm | Dump | Total | Capacity | Energy | Total | | |
| -4 | 1985 | 6.0 | - | - | 325.9 | 0 | 325.9 | - | - | - | 325.9 | 0 | 325.9 | 1.4 | 8.5 | 9.9 | 1.3310 | 13.2 |
| -3 | 1986 | 15.0 | - | - | 331.6 | 51.6 | 383.2 | - | - | - | 331.6 | 51.6 | 383.2 | 3.6 | 9.3 | 12.9 | 1.2100 | 15.6 |
| -2 | 1987 | 25.0 | - | - | 331.6 | 146.2 | 477.8 | - | - | - | 331.6 | 146.2 | 477.8 | 5.9 | 10.5 | 16.4 | 1.1000 | 18.0 |
| -1 | 1988 | 36.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 8.5 | 11.0 | 19.5 | 1.0000 | 19.5 |
| 1 | 1989 | 45.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 10.7 | 11.0 | 21.7 | 0.9091 | 19.7 |
| 2 | 1990 | 45.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 10.7 | 11.0 | 21.7 | 0.8264 | 17.9 |
| 3 | 1991 | 45.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 10.7 | 11.0 | 21.7 | 0.7513 | 16.3 |
| 4 | 1992 | 45.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 10.7 | 11.0 | 21.7 | 0.6830 | 14.8 |
| 5 | 1993 | 45.0 | - | - | 331.6 | 184.6 | 516.2 | - | - | - | 331.6 | 184.6 | 516.2 | 10.7 | 11.0 | 21.7 | 0.6209 | 13.5 |
| 6 | 1994 | 45.0 | 41.0 | 86.0 | 331.6 | 184.6 | 516.2 | 329.3 | 6.3 | 335.6 | 660.9 | 190.9 | 851.8 | 20.4 | 19.7 | 40.1 | 0.5645 | 22.6 |
| 7 | 1995 | 45.0 | 61.0 | 106.0 | 331.6 | 184.6 | 516.2 | 329.3 | 6.3 | 335.6 | 660.9 | 190.9 | 851.8 | 25.1 | 19.7 | 44.8 | 0.5132 | 23.0 |
| 8 | 1996 | 45.0 | 71.0 | 116.0 | 331.6 | 184.6 | 516.2 | 329.3 | 6.3 | 335.6 | 660.9 | 190.9 | 851.8 | 27.5 | 19.7 | 47.2 | 0.4665 | |
| 9 | 1997 | 45.0 | 71.0 | 116.0 | 331.6 | 184.6 | 516.2 | 329.3 | 6.3 | 335.6 | 660.9 | 190.9 | 851.8 | 27.5 | 19.7 | 47.2 | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | (47.2 x 9.7570 x 0.5132 = 236.3) | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| 46 | 2034 | 45.0 | 71.0 | 116.0 | 331.6 | 184.6 | 516.2 | 329.3 | 6.3 | 335.6 | 660.9 | 190.9 | 851.8 | 27.5 | 19.7 | 47.2 | 0.0124 | |
| 47 | 2035 | - | 71.0 | 71.0 | - | - | - | 329.3 | 6.3 | 335.6 | 329.3 | 6.3 | 335.6 | 16.8 | 8.6 | 25.4 | 0.0113 | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | (25.4 x 5.7590 x 0.5124 = 1.8) | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| . | . | | | | | | | | | | | | | | | | | |
| 55 | 2043 | - | 71.0 | 71.0 | - | - | - | 329.3 | 6.3 | 335.6 | 329.3 | 6.3 | 335.6 | | | | | |
| Total: | | | | | | | | | | | | | | | | | | 432.2 |

Annual equivalent benefit = 432.2 x 0.1009 = 43.6 x $10^6$ US$

Table A-8.6 DISBURSEMENT SCHEDULE OF FINANCIAL COST (SOOK DAM AND POWER STATION + TENOM PANGI EXTENSION - PHASE III ONLY)

| Item | Total amount | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| I. Total financial cost | | | | | | |
| 1. Sook dam and power station | 101,555 | 6,722 | 17,649 | 15,600 | 34,537 | 27,047 |
| 2. Tenom Pangi extension | 72,584 | 2,200 | 7,235 | 12,569 | 28,340 | 22,240 |
| 3. Total | 174,139 | 8,922 | 24,884 | 28,169 | 62,877 | 49,287 |
| II. Foreign currency portion | | | | | | |
| 1. Sook dam and power station | 47,127 | 2,841 | 8,669 | 7,411 | 15,141 | 13,065 |
| 2. Tenom Pangi extension | 49,071 | 1,760 | 2,278 | 8,066 | 20,373 | 16,594 |
| 3. Total | 96,198 | 4,601 | 10,947 | 15,477 | 35,514 | 29,659 |
| III. Local currency portion | | | | | | |
| 1. Sook dam and power station | 54,428 | 3,879 | 8,977 | 8,188 | 19,392 | 13,992 |
| 2. Tenom Pangi extension | 23,513 | 440 | 4,957 | 4,503 | 7,967 | 5,646 |
| 3. Total | 77,941 | 4,319 | 13,934 | 12,691 | 27,359 | 19,638 |

Table A-8.7(1) DISBURSEMENT SCHEDULE OF FINANCIAL COST (TOTAL) OF SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 3,360 | - | 2,016 | 1,344 | - | - | - |
| 2. | River Diversion Work | 7,991 | - | 443 | 4,883 | 887 | - | 1,778 |
| 3. | Main Dam | 23,804 | - | - | 3,662 | 6,408 | 10,986 | 2,740 |
| 4. | Saddle Dam | 3,795 | - | 237 | 2,846 | 712 | - | - |
| 5. | Spillway | 8,110 | - | - | 1,520 | 3,041 | 3,041 | 508 |
| 6. | River Outlet Work | 441 | - | - | - | 220 | - | 221 |
| 7. | Intake Structure | 649 | - | - | - | 216 | 433 | - |
| 8. | Waterway and Surge Tank | 2,885 | - | - | - | - | 1,511 | 1,374 |
| 9. | Penstock Line | 1,029 | - | - | - | 571 | 458 | - |
| 10. | Powerhouse and Tailrace | 2,675 | - | - | - | 81 | 1,234 | 1,360 |
| 11. | Switch Yard | 91 | - | - | - | - | - | 91 |
| 12. | Hydro-mechanical Works | 5,117 | - | - | - | - | 2,653 | 2,164 |
| 13. | Generating Equipment | 7,500 | - | - | - | 394 | 2,368 | 2,738 |
| 14. | Transmission Line | 1,000 | - | - | - | - | - | 1,000 |
| 15. | Sub-total | 68,447 | - | 2,696 | 14,255 | 12,530 | 22,684 | 16,282 |
| 16. | Engineering and Administration | 5,476 | - | 2,415 | 790 | 652 | 1,014 | 605 |
| 17. | Compensation | 18,400 | - | 1,000 | 1,000 | 1,000 | 7,700 | 7,700 |
| 18. | Physical Contingency | 9,232 | - | 611 | 1,604 | 1,416 | 3,139 | 2,460 |
| 19. | Total | 101,555 | - | 6,722 | 17,649 | 15,600 | 34,537 | 27,047 |

Table A-8.7(2) DISBURSEMENT SCHEDULE OF FINANCIAL COST (FOREIGN CURRENCY PORTION) OF SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 651 | - | 390 | 261 | - | - | - |
| 2. | River Diversion Work | 5,010 | - | 278 | 3,061 | 556 | - | 1,115 |
| 3. | Main Dam | 12,049 | - | - | 1,853 | 3,243 | 5,561 | 1,392 |
| 4. | Saddle Dam | 2,009 | - | 125 | 1,506 | 378 | - | - |
| 5. | Spillway | 3,305 | - | - | 619 | 1,239 | 1,239 | 208 |
| 6. | River Outlet Work | 249 | - | - | - | 124 | - | 125 |
| 7. | Intake Structure | 277 | - | - | - | 92 | 185 | - |
| 8. | Waterway and Surge Tank | 1,737 | - | - | - | - | 909 | 828 |
| 9. | Penstock Line | 464 | - | - | - | 257 | 207 | - |
| 10. | Powerhouse and Tailrace | 983 | - | - | - | 30 | 453 | 500 |
| 11. | Switch Yard | 34 | - | - | - | - | - | 34 |
| 12. | Hydro-mechanical Works | 4,094 | - | - | - | - | 2,122 | 1,972 |
| 13. | Generating Equipment | 6,750 | - | - | - | 355 | 2,131 | 4,264 |
| 14. | Transmission Line | 850 | - | - | - | - | - | 850 |
| 15. | Sub-total | 38,462 | - | 795 | 7,300 | 6,274 | 12,807 | 11,288 |
| 16. | Engineering and Administration | 4,381 | - | 1,790 | 581 | 464 | 958 | 588 |
| 17. | Compensation | - | - | - | - | - | - | - |
| 18. | Physical Contingency | 4,284 | - | 258 | 788 | 673 | 1,376 | 1,189 |
| 19. | Total | 47,127 | - | 2,841 | 8,669 | 7,411 | 15,141 | 13,065 |

Table A-8.7 (3) DISBURSEMENT SCHEDULE OF FINANCIAL COST (LOCAL CURRENCY PORTION) OF SOOK DAM AND POWER STATION

(Unit: $10^3$US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 2,709 | - | 1,625 | 1,084 | - | - | - |
| 2. | River Diversion Work | 2,981 | - | 165 | 1,821 | 331 | - | 664 |
| 3. | Main Dam | 11,755 | - | - | 1,808 | 3,164 | 5,425 | 1,358 |
| 4. | Saddle Dam | 1,786 | - | 111 | 1,339 | 336 | - | - |
| 5. | Spillway | 4,805 | - | - | 900 | 1,801 | 1,801 | 303 |
| 6. | River Outlet Work | 192 | - | - | - | 96 | - | 96 |
| 7. | Intake Structure | 372 | - | - | - | 124 | 248 | - |
| 8. | Waterway and Surge Tank | 1,148 | - | - | - | - | 601 | 547 |
| 9. | Penstock Line | 565 | - | - | - | 313 | 252 | - |
| 10. | Powerhouse and Tailrace | 1,692 | - | - | - | 51 | 780 | 861 |
| 11. | Switch Yard | 57 | - | - | - | - | - | 57 |
| 12. | Hydro-mechanical Works | 1,023 | - | - | - | - | 530 | 493 |
| 13. | Generating Equipment | 750 | - | - | - | 39 | 236 | 475 |
| 14. | Transmission Line | 150 | - | - | - | - | - | 150 |
| 15. | Sub-total | 29,985 | - | 1,901 | 6,852 | 6,255 | 5,873 | 5,004 |
| 16. | Engineering and Administration | 1,095 | - | 625 | 209 | 188 | 56 | 17 |
| 17. | Compensation | 18,400 | - | 1,000 | 1,000 | 1,000 | 7,700 | 7,700 |
| 18. | Physical Contingency | 4,948 | - | 353 | 816 | 745 | 1,763 | 1,271 |
| 19. | Total | 54,428 | - | 3,879 | 8,977 | 8,188 | 19,392 | 13,992 |

Table A-8.8 (1) DISBURSEMENT SCHEDULE OF FINANCIAL COST (TOTAL) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 5,460 | | | 5,460 | | | |
| 2. | Intake Structures | 600 | | | | 200 | 200 | 200 |
| 3. | Waterway & Surge Tank | 23,872 | | | 917 | 5,814 | 10,710 | 6,431 |
| 4. | Penstock Line | 1,997 | | | | 703 | 703 | 591 |
| 5. | Powerhouse & Tailrace | 4,342 | | | | 1,860 | 1,549 | 933 |
| 6. | Hydro-Mechanical Works | 6,826 | | | | 620 | 3,722 | 2,484 |
| 7. | Generating Equipment | 12,000 | | | | 570 | 4,570 | 6,860 |
| 8. | Substation Equipment | 6,000 | | | | 1,200 | 3,000 | 1,800 |
| 9. | Sub-Total | 61,097 | 0 | 0 | 6,377 | 10,967 | 24,454 | 19,299 |
| 10. | Engineering & Administration | 4,888 | 0 | 2,000 | 201 | 460 | 1,310 | 917 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 6,599 | 0 | 200 | 657 | 1,142 | 2,576 | 2,024 |
| 13. | Total | 72,584 | 0 | 2,200 | 7,235 | 12,569 | 28,340 | 22,240 |

Note: Engineering Cost for detail design is capitalyed to 1989.
Its amount is 2,000 x $10^3$ US$

Table A-8.8 (2) DISBURSEMENT SCHEDULE OF FINANCIAL COST (FOREIGN CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 1,386 | | | 1,386 | | | |
| 2. | Intake Structures | 210 | | | | 70 | 70 | 70 |
| 3. | Waterway & Surge Tank | 15,513 | | | 596 | 3,778 | 6,960 | 4,179 |
| 4. | Penstock Line | 1,306 | | | | 460 | 460 | 386 |
| 5. | Powerhouse & Tailrace | 1,534 | | | | 657 | 547 | 330 |
| 6. | Hydro-Mechanical Works | 5,461 | | | | 496 | 2,978 | 1,987 |
| 7. | Generating Equipment | 10,200 | | | | 485 | 3,885 | 5,830 |
| 8. | Substation Equipment | 5,100 | | | | 1,020 | 2,550 | 1,530 |
| 9. | Sub-Total | 40,710 | 0 | 0 | 1,982 | 6,966 | 17,450 | 14,312 |
| 10. | Engineering & Administration | 3,900 | 0 | 1,600 | 89 | 367 | 1,071 | 773 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 4,461 | 0 | 160 | 207 | 733 | 1,852 | 1,509 |
| 13. | Total | 49,071 | 0 | 1,760 | 2,278 | 8,066 | 20,373 | 16,594 |

Table A-8.8 (3) DISBURSEMENT SCHEDULE OF FINANCIAL COST (LOCAL CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: $10^3$ US$)

| | Work Item | Total Amount | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|
| 1. | Preparatory Work | 4,074 | | | 4,074 | | | |
| 2. | Intake Structures | 390 | | | | 130 | 130 | 130 |
| 3. | Waterway & Surge Tank | 8,359 | | | 321 | 2,036 | 3,750 | 2,252 |
| 4. | Penstock Line | 691 | | | | 243 | 243 | 205 |
| 5. | Powerhouse & Tailrace | 2,808 | | | | 1,203 | 1,002 | 603 |
| 6. | Hydro-Mechanical Works | 1,365 | | | | 124 | 744 | 497 |
| 7. | Generating Equipment | 1,800 | | | | 85 | 685 | 1,030 |
| 8. | Substation Equipment | 900 | | | | 180 | 450 | 270 |
| 9. | Sub-Total | 20,387 | 0 | 0 | 4,395 | 4,001 | 7,004 | 4,987 |
| 10. | Engineering & Administration | 988 | 0 | 400 | 112 | 93 | 239 | 144 |
| 11. | Compensation | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. | Physical Contingency | 2,138 | 0 | 40 | 450 | 409 | 724 | 515 |
| 13. | Total | 23,513 | 0 | 440 | 4,957 | 4,503 | 7,967 | 5,646 |

Table A-8.9 FINANCIAL STATEMENT (SOOK DAM AND POWER STATION + TENOM PANGI EXTENSION - PHASE III ONLY) (1)

(UNIT: $10^3$ US$)

| No. | Year | Expenditure | | Project revenue | OMR costs | Net income | Repayment | | | | | | Total repayment | Surplus or deficit | Accumulated Surplus or deficit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Principal | | Interest | | Total | | | | |
| | | Local c. | Foreign c. | | | | Local c. | Foreign c. | Local c. | Foreign c. | Local c. | Foreign c. | | | |
| 0 | 1985 | | | | | | | | | | | | | | |
| 1 | 1986 | | | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1987 | | | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 1988 | | | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1989 | 4,319 | 4,601 | 0 | | 0 | 0 | 0 | 367 | 184 | 367 | 184 | 551 | -551 | -551 |
| 5 | 1990 | 13,934 | 10,947 | 0 | | 0 | 0 | 0 | 1,551 | 621 | 1,551 | 621 | 2,172 | -2,172 | -2,723 |
| 6 | 1991 | 12,691 | 15,477 | 0 | | 0 | 0 | 0 | 2,630 | 1,241 | 2,630 | 1,241 | 3,871 | -3,871 | -6,594 |
| 7 | 1992 | 27,359 | 35,514 | 0 | | 0 | 0 | 0 | 4,955 | 2,661 | 4,955 | 2,661 | 7,616 | -7,616 | -14,210 |
| 8 | 1993 | 19,638 | 29,659 | 0 | | 0 | 0 | 0 | 6,624 | 3,847 | 6,624 | 3,847 | 10,471 | -10,471 | -24,681 |
| 9 | 1994 | | | 24,335 | 2,610 | 21,725 | 991 | 0 | 6,624 | 3,847 | 7,615 | 3,847 | 11,462 | 10,263 | -14,418 |
| 10 | 1995 | | | 24,335 | 2,610 | 21,725 | 1,075 | 0 | 6,540 | 3,847 | 7,615 | 3,847 | 11,462 | 10,263 | -4,115 |
| 11 | 1996 | | | 24,335 | 2,610 | 21,725 | 1,166 | 5,786 | 6,449 | 3,848 | 7,615 | 9,634 | 17,249 | 4,476 | 321 |
| 12 | 1997 | | | 24,335 | 2,610 | 21,725 | 1,265 | 6,017 | 6,350 | 3,617 | 7,615 | 9,634 | 17,249 | 4,476 | 4,797 |
| 13 | 1998 | | | 24,335 | 2,610 | 21,725 | 1,373 | 6,258 | 6,242 | 3,376 | 7,615 | 9,634 | 17,249 | 4,476 | 9,273 |
| 14 | 1999 | | | 24,335 | 2,610 | 21,725 | 1,489 | 6,508 | 6,126 | 3,126 | 7,615 | 9,634 | 17,249 | 4,476 | 13,749 |
| 15 | 2000 | | | 24,335 | 2,610 | 21,725 | 1,616 | 6,768 | 5,999 | 2,866 | 7,615 | 9,634 | 17,249 | 4,476 | 18,225 |
| 16 | 2001 | | | 24,335 | 2,610 | 21,725 | 1,753 | 7,039 | 5,862 | 2,595 | 7,615 | 9,634 | 17,249 | 4,476 | 22,701 |
| 17 | 2002 | | | 24,335 | 2,610 | 21,725 | 1,902 | 7,321 | 5,713 | 2,313 | 7,615 | 9,634 | 17,249 | 4,476 | 27,177 |
| 18 | 2003 | | | 24,335 | 2,610 | 21,725 | 2,064 | 7,613 | 5,551 | 2,021 | 7,615 | 9,634 | 17,249 | 4,476 | 31,653 |
| 19 | 2004 | | | 24,335 | 2,610 | 21,725 | 2,240 | 7,918 | 5,375 | 1,716 | 7,615 | 9,634 | 17,249 | 4,476 | 36,129 |
| 20 | 2005 | | | 24,335 | 2,610 | 21,725 | 2,430 | 8,235 | 5,185 | 1,399 | 7,615 | 9,634 | 17,249 | 4,476 | 40,605 |
| 21 | 2006 | | | 24,335 | 2,610 | 21,725 | 2,636 | 8,564 | 4,979 | 1,070 | 7,615 | 9,634 | 17,249 | 4,476 | 45,081 |
| 22 | 2007 | | | 24,335 | 2,610 | 21,725 | 2,861 | 8,907 | 4,754 | 727 | 7,615 | 9,634 | 17,249 | 4,476 | 49,557 |
| 23 | 2008 | | | 24,335 | 2,610 | 21,725 | 3,104 | 9,264 | 4,511 | 370 | 7,615 | 9,634 | 17,249 | 4,476 | 54,033 |
| 24 | 2009 | | | 24,335 | 2,610 | 21,725 | 3,368 | | 4,247 | | 7,615 | | 7,615 | 14,110 | 68,143 |
| 25 | 2010 | | | 24,335 | 2,610 | 21,725 | 3,654 | | 3,961 | | 7,615 | | 7,615 | 14,110 | 82,253 |
| 26 | 2011 | | | 24,335 | 2,610 | 21,725 | 3,964 | | 3,651 | | 7,615 | | 7,615 | 14,110 | 96,363 |
| 27 | 2012 | | | 24,335 | 2,610 | 21,725 | 4,301 | | 3,314 | | 7,615 | | 7,615 | 14,110 | 110,473 |
| 28 | 2013 | | | 24,335 | 2,610 | 21,725 | 4,667 | | 2,948 | | 7,615 | | 7,615 | 14,110 | 124,583 |
| 29 | 2014 | | | 24,335 | 2,610 | 21,725 | 5,064 | | 2,551 | | 7,615 | | 7,615 | 14,110 | 138,693 |
| 30 | 2015 | | | 24,335 | 2,610 | 21,725 | 5,494 | | 2,121 | | 7,615 | | 7,615 | 14,110 | 152,803 |
| 31 | 2016 | | | 24,335 | 2,610 | 21,725 | 5,961 | | 1,654 | | 7,615 | | 7,615 | 14,110 | 166,913 |
| 32 | 2017 | | | 24,335 | 2,610 | 21,725 | 6,468 | | 1,147 | | 7,615 | | 7,615 | 14,110 | 181,023 |
| 33 | 2018 | | | 24,335 | 2,610 | 21,725 | 7,035 | | 580 | | 7,615 | | 7,615 | 14,110 | 195,133 |
| Total: | | 77,941 | 96,198 | 608,375 | 65,250 | 543,125 | 77,941 | 96,198 | 128,561 | 45,292 | 206,502 | 141,490 | 347,992 | 195,133 | — |

Loan conditions:

Interest of Local c : 8.5 (%), Grace period : 5 yrs, Repayment period (excluding grace period) : 25 yrs
Interest of Foreign c: 4 (%), Grace period : 7 yrs, Repayment period (excluding grace period) : 13 yrs

Table A-8.10 FINANCIAL STATEMENT (SOOK DAM AND POWER STATION + TENOM PANGI EXTENSION - PHASE III ONLY) (2)

(UNIT: $10^3$ US$)

| No. | Year | Expenditure | | Project revenue | OMR costs | Net income | Repayment | | | | | | Total repayment | Surplus or deficit | Accumulated Surplus or deficit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Principal | | Interest | | Total | | | | |
| | | Local c. | Foreign c. | | | | Local c. | Foreign c. | Local c. | Foreign c. | Local c. | Foreign c. | | | |
| 0 | 1985 | | | | | | | | | | | | | | |
| 1 | 1986 | | | 0 | | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| 2 | 1987 | | | 0 | | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| 3 | 1988 | | | 0 | | 0 | | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |
| 4 | 1989 | 4,319 | 4,601 | 0 | | 0 | 0 | 0 | 367 | 230 | 367 | 230 | 597 | -597 | -597 |
| 5 | 1990 | 13,934 | 10,947 | 0 | | 0 | 0 | 0 | 1,551 | 777 | 1,551 | 777 | 2,328 | -2,328 | -2,925 |
| 6 | 1991 | 12,691 | 15,477 | 0 | | 0 | 0 | 0 | 2,630 | 1,551 | 2,630 | 1,551 | 4,181 | -4,181 | -7,106 |
| 7 | 1992 | 27,359 | 35,514 | 0 | | 0 | 0 | 0 | 4,955 | 3,326 | 4,955 | 3,326 | 8,281 | -8,281 | -15,387 |
| 8 | 1993 | 19,638 | 29,659 | 0 | | 0 | 0 | 0 | 6,624 | 4,809 | 6,624 | 4,809 | 11,433 | -11,433 | -26,820 |
| 9 | 1994 | | | 24,335 | 2,610 | 21,725 | 991 | 0 | 6,624 | 4,809 | 7,615 | 4,809 | 12,424 | 9,301 | -17,519 |
| 10 | 1995 | | | 24,335 | 2,610 | 21,725 | 1,075 | 0 | 6,540 | 4,809 | 7,615 | 4,809 | 12,424 | 9,301 | -8,218 |
| 11 | 1996 | | | 24,335 | 2,610 | 21,725 | 1,166 | 3,420 | 6,449 | 4,809 | 7,615 | 8,229 | 15,844 | 5,881 | -2,337 |
| 12 | 1997 | | | 24,335 | 2,610 | 21,725 | 1,265 | 3,591 | 6,350 | 4,638 | 7,615 | 8,229 | 15,844 | 5,881 | 3,544 |
| 13 | 1998 | | | 24,335 | 2,610 | 21,725 | 1,373 | 3,770 | 6,242 | 4,459 | 7,615 | 8,229 | 15,844 | 5,881 | 9,425 |
| 14 | 1999 | | | 24,335 | 2,610 | 21,725 | 1,489 | 3,959 | 6,126 | 4,270 | 7,615 | 8,229 | 15,844 | 5,881 | 15,306 |
| 15 | 2000 | | | 24,335 | 2,610 | 21,725 | 1,616 | 4,157 | 5,999 | 4,072 | 7,615 | 8,229 | 15,844 | 5,881 | 21,187 |
| 16 | 2001 | | | 24,335 | 2,610 | 21,725 | 1,753 | 4,364 | 5,862 | 3,865 | 7,615 | 8,229 | 15,844 | 5,881 | 27,068 |
| 17 | 2002 | | | 24,335 | 2,610 | 21,725 | 1,902 | 4,583 | 5,713 | 3,646 | 7,615 | 8,229 | 15,844 | 5,881 | 32,949 |
| 18 | 2003 | | | 24,335 | 2,610 | 21,725 | 2,064 | 4,812 | 5,551 | 3,417 | 7,615 | 8,229 | 15,844 | 5,881 | 38,830 |
| 19 | 2004 | | | 24,335 | 2,610 | 21,725 | 2,240 | 5,052 | 5,375 | 3,177 | 7,615 | 8,229 | 15,844 | 5,881 | 44,711 |
| 20 | 2005 | | | 24,335 | 2,610 | 21,725 | 2,430 | 5,305 | 5,185 | 2,924 | 7,615 | 8,229 | 15,844 | 5,881 | 50,592 |
| 21 | 2006 | | | 24,335 | 2,610 | 21,725 | 2,636 | 5,570 | 4,979 | 2,659 | 7,615 | 8,229 | 15,844 | 5,881 | 56,473 |
| 22 | 2007 | | | 24,335 | 2,610 | 21,725 | 2,861 | 5,849 | 4,754 | 2,380 | 7,615 | 8,229 | 15,844 | 5,881 | 62,354 |
| 23 | 2008 | | | 24,335 | 2,610 | 21,725 | 3,104 | 6,141 | 4,511 | 2,088 | 7,615 | 8,229 | 15,844 | 5,881 | 68,235 |
| 24 | 2009 | | | 24,335 | 2,610 | 21,725 | 3,368 | 6,448 | 4,247 | 1,781 | 7,615 | 8,229 | 15,844 | 5,881 | 74,116 |
| 25 | 2010 | | | 24,335 | 2,610 | 21,725 | 3,654 | 6,771 | 3,961 | 1,458 | 7,615 | 8,229 | 15,844 | 5,881 | 79,997 |
| 26 | 2011 | | | 24,335 | 2,610 | 21,725 | 3,964 | 7,109 | 3,651 | 1,120 | 7,615 | 8,229 | 15,844 | 5,881 | 85,878 |
| 27 | 2012 | | | 24,335 | 2,610 | 21,725 | 4,301 | 7,465 | 3,314 | 764 | 7,615 | 8,229 | 15,844 | 5,881 | 91,759 |
| 28 | 2013 | | | 24,335 | 2,610 | 21,725 | 4,667 | 7,832 | 2,948 | 391 | 7,615 | 8,223 | 15,838 | 5,887 | 97,646 |
| 29 | 2014 | | | 24,335 | 2,610 | 21,725 | 5,064 | | 2,551 | | 7,615 | | 7,615 | 14,110 | 111,756 |
| 30 | 2015 | | | 24,335 | 2,610 | 21,725 | 5,494 | | 2,121 | | 7,615 | | 7,615 | 14,110 | 125,866 |
| 31 | 2016 | | | 24,335 | 2,610 | 21,725 | 5,961 | | 1,654 | | 7,615 | | 7,615 | 14,110 | 139,976 |
| 32 | 2017 | | | 24,335 | 2,610 | 21,725 | 6,468 | | 1,147 | | 7,615 | | 7,615 | 14,110 | 154,086 |
| 33 | 2018 | | | 24,335 | 2,610 | 21,725 | 7,035 | | 580 | | 7,615 | | 7,615 | 14,110 | 168,196 |
| Total: | | 77,941 | 96,198 | 608,375 | 65,250 | 543,125 | 77,941 | 96,198 | 128,561 | 72,229 | 206,502 | 168,427 | 374,929 | 168,196 | — |

Loan conditions:

Interest of Local c : 8.5 (%), Grace period : 5 yrs, Repayment period (excluding grace period) : 25 yrs
Interest of Foreign c: 5 (%), Grace period : 7 yrs, Repayment period (excluding grace period) : 18 yrs

## A-8.1 Suggestions from the Department of Environment on Detailed Socio-environmental Investigations

### 1. Suggestions from the Department of Environment

The followings are the suggestions from the Department of Environment (Jabatan Alam Sekitar, KL) which are useful for the definite study on socio-environmental aspects to be made in the next stage:

1) An environmental impact assessment study should include the followings:

   i) Describe the proposed project as well as the options/alternatives.

   ii) Describe the existing environment clearly.

   iii) Predict the nature and the extend of the environmental effects. The probable impact of the project on the environmental effects which are unavoidable.

   iv) Identify the relevant human concerns.

   v) Assess the significant of the impact.

   vi) Recommend appropriate mitigating and abatement measures to incorporate into the project plan.

   vii) Identify the costs and benefits of the project to the community.

   viii) What long term uses can be made of the same environment if the proposed project is abandoned.

2) Scope of work as suggested:

i) Soil erosion within reservoir catchment including shoreline erosion of reservoir.

ii) Effect of change of water quality on riverine ecology and fisheries. It is important here to highlight the possible impacts of agricultural activities at the upper stream of the proposed project. Types of agricultural activities need to be specified clearly.

iii) Impact of project on wildlife due to loss of habitats.

iv) Possible increase in occurrence of water-borne diseases. Schistosomiasis does not currently occur in Malaysia (S. Japonium or S. Mekongi) but the reservoir conditions might induce the proliferation of a suitable snail host.

v) Loss of archeological, natural and cultural preserves due to impoundment.

vi) Social economic-effect which include survey for assessing the socio-economic situation of the population affected by the project and discussion for managing resettlement. This should be discussed in detail including cost for new infrastructure and relocation of people. Socio-economic study should preferably be done by a neutral organization not by anybody from the project or indirectly connected to the project.

vii) Cost due to loss of agricultural areas, infrastructure and other buildings.

viii) Timing for the resettlement programme. Areas for the relocation of families and whether these are suitable and acceptable in relation to religious and cultural factors, the type of employment or work of the population, the suitability of soil accessibility, communications, etc.

## 2. Detailed Assessment Report and Format

In addition to the above suggestions, the following basic guide line on the socio-environmental assessment report and format is also useful, which is also prepared by the Department of Environment.

### 1) Project Title

Project title should identify the type of project proposed and its specific location. The title should indicate too if the project is part of a larger proposal.

References immediately following the title should include:

(a) The Preliminary Assessment report, its date and the approving authority to whom it was submitted;

(b) The Detailed Assessment Brief containing the terms of reference for the assessment.

### 2) Project Initiator

A clear statement is required as to which public or private organization has initiated and is responsible for the project. If the Detailed Assessment has not been carried out "in house", the name of the consultant or the organization appointed to conduct the Detailed Assessment should be given. It should also make quite clear the organization and the individual (the assessor) to whom any enquiries should be directed.

### 3) Statement of Need

The statement of need should outline the background to the project and the reason for its being proposed. It should establish a social, economic or other need for the project and should conclude with a definite statement of the aim of the project.

4) Project Description

A description of the final project proposal is required.It should include:

(a) A description of the project concept with an indication of the magnitude of the project in terms of product, raw materials and energy consumption and the land, water, labour, transportation, investment, market and special infrastructural requirements;

(b) Maps and diagrams (photographs might also be useful to describe some projects);

(c) A summary of those technical, economic and environmental features that are essential to the project.

5) Existing Environment

The description of the existing environment should identify as appropriate:

(a) The conditions, in qualitative and quantitative terms, of the physico-chemical, biological and human environment prior to implementation of the project;

(b) The spatial boundaries within which the environment has been considered;

(c) Environmentally sensitive areas of special or unique scientific, socio-economic or cultural value.

6) Project Options

Within the constraints of the aim and broad economic, technical and environmental factors a number of project options in terms of size, technology, raw materials, energy sources or even product may have been identified and considered. The principle features of each option should be given and the economic, technical and environmental advantages and disadvantages of each discussed and

evaluated. Included in the discussion should be the "no project" option. This is an opportunity for the assessor to highlight any social, economic or environmental benefits that will accrue from the project and which would be denied to the community if the project were to be abandoned. If more than one site option is available they'all should be discussed and compared.

7) Results of Preliminary Assessment

Using a Level 2 matrix for reference this section should summarize, from the Preliminary Assessment Report, the impacts of unknown significance and the residual adverse significant impacts expected to occur. Mention should be made of any cumulative, synergistic or antagonistic environmental effects expected.

The discussion should state:

(a) The nature of the environmental effect (e.g. air quality changes);

(b) The source of the impact (e.g. oil-fired furnace chimney emission);

(c) The nature of the impact (e.g. human health, visual aesthetics);

(d) Any mitigating or abatement measures which were adopted during Preliminary Assessment to lessen the impact.

8) Detailed Examination of Impacts

Each of the impacts listed in the previous section should be discussed in the light of additional environmental or project information obtained and of any further mitigating and abatement measures considered. The methodologies used should be described. The discussion should include an evaluation of all mitigating or abatement measures considered during both Preliminary Assessment and Detailed Assessment irrespective of whether or not they have been adopted.

9) Project Evaluation

In this section the assessor should seek to quantity the environmental and development trade-offs anticipated from the final project plan.

10) Summary of Conclusions

The project initiator should draw appropriate conclusions in each section of his report. It is useful however, to have the conclusions summarized in a series of brief statements referring to relevant sections of the report.

11) Sources of Date, Consultations and Public Participation

The individuals or agencies consulted and the environmental data collected during Preliminary Assessment and Detailed Assessment should be quoted to support conclusion in each section of the Detailed Assessment Report and should be fully documented in this section. Documentation of consultation with specialists should include the person's name and the organization he represents, the form of the communication and the data. Written opinions received from specialists should be appended. The form, extent and results of public participation during Preliminary Assessment and Detailed Assessment should be reported in full.

12) References

Scientific and technical publications used or quoted in the report should be listed.

3. Recommendation for Detailed Socio-Environmental Investigations

1) The Department of Environment suggests that socio-economic study should preferably be done by a neutral organization not by anybody from the project or indirectly connected to the project. This suggestion is not only limited to the socio-economic study but also can be applied to the whole socio-environmental investigations.

Therefore it is strongly recommended that the detailed socio-environmental investigations should be carried out by a neutral organization such as an university or the Department of Environment using some consulting firms if needed.

2) It is recommended to immediately identify or organize a government agency who will be responsible for making the relocation plan and program.