(5) Engineering fee

15% of the total construction cost is appropriated for the engineering fee.

(6) Technical staff training cost

The costs for TANESCO's technical staff overseas training for construction works as well as for improvement of the equipment and facilities necessary for maintenance services.

(7) Currency conversion rate

The conversion rates used in the calculation are taken as follows:

1 US$ = 124.9 yen
1 US$ = 325 T.sh
1 Yen = 2.602 T.sh

12.2 FOREIGN CURRENCY AND LOCAL CURRENCY PORTION

The foreign currency and local currency portion of the construction cost shall be as shown below:

(1) Foreign currency portion

(a) Construction equipment and materials: All necessary items except for gravel, sand and cement.

(b) Vehicles and tools: All vehicles, tools and measuring instruments necessary for the construction works.

(c) Transportation cost and insurance: Ocean freight and domestic transportation cost in Tanzania, and insurance.

(d) Labor cost: The cost necessary for dispatching engineers for installation of large-sized equipment and adjustment thereof in the substation construction works.

(e) Consultant fee and technical staff training costs

(2) Local currency portion

(a) Labor cost

(b) Construction materials: Various minor materials to be procured locally in Tanzania for the construction works such as gravel, sand and cement, etc.

12.3 CONSTRUCTION COST ESTIMATION

(1) Total construction cost for the long-term master plan (for 15 years from 1993 to 2007) includes the following:

Foreign currency portion (million yen): 11,848

Home currency portion (million T.sh): Included in the foreign currency portion.

(2) Total construction cost for the short-term master plan (for 5 years from 1993 to 1997) includes the following:

Short-term (5 year) master plan construction cost

	Foreign currency (Million yen)	Local currency (Million yen)	Total (Million yen)	Amount to be borne by Tanzania side (Million Tsh)
(For construction works to be completed in 1994)				
Transmission Line	215.1	26.9	242.0	14.5 (*1)
Substation	1,313.9	77.3	1,391.2	230.0 (*2)
Distribution Line	72.7	1.4	74.1	17.0 (*3)
Vehicles and tools	149.9	2.9	152.8	-
Others	95.4	1.8	97.2	-
Subtotal	1,847.0	110.3	1,957.3	261.5
Contingency	277.0	16.5	293.6	-
Total for construction works to be completed in 1994	2,124.0	126.8	2,250.9	261.5
(For construction works to be completed in 1996)				
Transmission Line	309.6	33.7	343.4	80.0 (*1)
Substation	1,328.2	78.1	1,406.3	209.5 (*2)
Distribution Line	114.8	2.2	117.0	51.0 (*3)
Vehicles and tools	164.6	3.2	167.8	-
Others	104.8	2.0	106.8	-
Subtotal	2,022.0	119.2	2,141.2	340.5
Contingency	303.3	17.9	321.2	-
Total for construction works to be completed in 1996	2,325.3	137.1	2,462.4	340.5
Total	3,869.0	229.5	4,098.5	602.0
Total (including contingent expense)	4,449.3	264.0	4,713.3	602.0

(Notes) (a) In the costs to be borne by Tanzania side:

(*1) Costs of 33 kV transmission line construction and land acquisition compensation

(*2) Costs of substation foundation works and land acquisition compensation.

(*3) Costs of distribution line construction and land acquisition compensation.

CHAPTER 13

ECONOMIC ANALYSIS

Chapter 13 Economic Analysis

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CHAPTER 13 ECONOMIC ANALYSIS

13.1 OBJECTIVE OF ECONOMIC ANALYSIS

The objective of economic analysis is to examine whether the implementation of a project is appropriate in terms of national economy. While a nation must carry out a variety of projects for its economic development, the capital resources available for those projects are limited, and have to be utilized in an effective manner. For that purpose, it is very important to choose good projects for investments.

If bad projects should be selected by mistake, the result will not only be a wasteful use of funds, but it will mean that other good projects have been driven out, and the nation's economic development might be retarted as a consequence.

Economic analysis differs from financial analysis in that the former evaluates projects "in terms of national economy" while the latter does same "from the standpoint of corporate profitability." Both analyses are important, and a financial analysis of this project is also going to be conducted in the next chapter. But, as far as a national project is concerned, it is of vital importance that the project is appropriate in terms of national economy, or economically feasible.

It is the objective of this economic analysis to see whether the present Project has such feasibility or not.

13.2 METHOD OF ECONOMIC ANALYSIS

13.2.1 With/Without Analysis

The terms "with" and "without" refer to the cases where the Project is implemented (With Project) and where it is not implemented (Without Project) respectively. "With" means the present Project itself, while "without" means an alternative in the event of non-implementation of this Project. In economic analysis, costs of the

alternative project are subtracted from those of the proposed project, or enumerated as one of the benefits relative to the proposed project. This method derives from the assumption that the costs of the alternative project would be expended if the proposed project should not be implemented, or would be saved if the proposed project should be implemented. In the same manner, benefits likely to be generated from the implementation of the alternative project are subtracted from the benefits expected from the present Project. In short, in this economic analysis, differences of both costs and benefits between the "with" case and the "without" case are obtained and calculated by the method mentioned in Section 13.2.3.

Yet, there seems to be no clear and definite alternative as to the present Project, unlike the case of a power generating project where there exists a choice between hydraulic or thermal power. It is particularly difficult to conceive an alternative with regard to the capacity reinforcement project like this (new construction and expansion of power supply system) which is needed to meet the future increase in electricity demand. The only conceivable alternative to the present Project would be to continue to operate and maintain the present facilities without upgrading or improving. In this case, the costs of operating and maintaining the existing facilities are deemed to be saved if the present Project replaces those facilities, and these savings are to be either deducted from the operation and maintenance costs of the present Project or enumerated as a benefit of same.

13.2.2 Scope of Analysis

This analysis deals with only the incremental portion of costs and benefits in connection with the implementation of the Project. Namely, it does not attempt to analyze the entire power supply system of Dar Es Salaam after completion of the project. In the meanwhile, the areas covered by this analysis are not limited to those where this short-term plan is to be carried out, but will comprise the whole Dar Es Salaam, considering that the whole system of the city is inseparably and closely related to the Project

areas. This short-term plan should not be seen as an independent project forming an isolated unit. On the contrary, it should be seen in the context of being an integral part of the power supply system of the City of Dar Es Salaam as a whole. The effect of the Project is, therefore, mutually complementary with the other areas of the city.

13.2.3 Evaluation Indices (Economic Internal Rate of Return: EIRR)

Using the costs (Project costs) and benefits both adjusted to economic values, such discount rate shall be obtained as will make the present worth of the cost stream equal to that of the benefit stream. This rate is called the Economic Internal Rate of Return or EIRR for short. If the EIRR obtained in this manner should exceed the social discount rate in Tanzania, the implementation of this Project will be deemed feasible in terms of Tanzania's national economy.

The term "costs and benefits adjusted to economic values" means the costs and benefits after being adjusted of such transfer items as taxes (to be deducted) and subsidies (to be added) from the market values and after the shadow price being applied to the exchange rate. Details shall be mentioned in relevant sections.

The EIRR can be obtained from the following equation.

$$0 = \sum_{i=1}^{n} \text{Net Flow } i / (1 + \text{EIRR})^{i-1}$$

There, the Net Flow is the stream of differences between the annual costs and benefits and "n" is the period of calculation under the economic analysis.

This period shall be 25 years from 1994 through 2018 as is mentioned in Section 13.3-(2).

13.3 PREREQUISITES

The main assumptions made in this analysis are as follows.

(1) Exchange Rate

The base period of this study is 1992. The exchange rates adopted in this analysis are the averages of the rates that were applicable in the second half (i.e., July through December) of 1992.

1 US Dollar = 124.90 yen = 325.00 Tanzanian Shillings
1 yen = 2.602 Tanzanian Shillings

Economic analysis sometimes uses shadow exchange rates (or market exchange rates) instead of official rates, for the former are often thought to reflect the real value of the currencies. However, as this might infringe upon the sovereignty of Tanzania, this method is not used in the present analysis. By the way, on August 25, 1993, Tanzania unified the official and other rates into single rate and made the rate be determined in accordance with market trends. The movements of the rate after these measures, however, have not shown any dramatic fluctuations. This may imply that the exchange rate mentioned above was rather close to the market rate even in the latter half of 1992.

(2) Calculation Period

According to the Financial Statements of TANESCO for the financial year 1990, the depreciation periods for facilities are 40 years for power transmission lines, 30 years for 11 kV feeders, and 20 years for transformers and substations. However, the real mechanical lives of the above facilities are longer than these depreciation periods. Considering this, the calculation period for this analysis was determined to be 25 years (i.e., from 1994 through 2018).

(3) Price Base and Price Escalation

Although the prices used are those as of 1992, they shall be deemed to be those of 1994, starting year of the calculation period.

In accordance with general principles of financial analysis, the calculations shall not incorporate price escalation. All the costs and benefits shall be discounted to the present worths as of the beginning of 1994.

(4) Power Distribution Loss Rate

Section 10.6.4-(1) of Chapter 10 deals with the effect of the Project in terms of reductions of power distribution losses. In this chapter, the volume of those reductions are cited and enumerated as one of the benefits. This means that the incremental power consumption, which is another benefit of the Project, should incorporate the pre-improvement (pre-Project) distribution losses. The pre-improvement distribution loss rates used in the calculations are 4.5% for 1994, 4.8% for 1995, and 5.1% for 1996 and thereafter. Those rates also derive from the study in Section 10.6.4-(1).

(5) Load Factor

The load factor is assumed to be 66% throughout the calculation period.

(6) Electricity Prices

T. Shs. 29.25/kWH is adopted.

The average electricity price as of 1992, the base year of this study, is not clearly known, but it can be estimated from TANESCO's electricity tariff.

TANESCO revised its electricity tariff in March 1993, and the new tariff states that the average price had been raised by 27% to become 7 US cents. The exchange rate of the Tanzanian

Shilling at that time was 350 Tanzanian Shillings per 1 US Dollar, so it can be estimated that the average price prior to the tariff increase had been T. Shs. 19.29/kWH.

Meanwhile, TANESCO's electricity tariff is thought to have always been relatively below-cost. To catch up with the gap, TANESCO have revised its tariff ex post facto. The revision in March 1993 was made in that context. However, TANESCO raised its electricity prices again in July of the same year, soon after the March revision. This seems to indicate that the July 1993 revision intended to cover the long-run marginal cost (LRMC) of TANESCO and therefore reflects economic electricity price as around 1992. Thus, the new tariff so revised was adopted in this analysis. The average tariff after the July 1993 increase stands at 9 US cents, that is, T. Shs. 29.25/kWH converted by 325 Tanzanian Shillings per US Dollar, exchange rate in the base year (1992).

(7) Sharing of Electricity Supply Cost

For the purpose of economic analysis, it was assumed that the electricity supply costs are shared among various divisions, and that the share of the transmission, substation and distribution divisions is 35% in total. This percentage was estimated from TANESCO's Financial Statements for the year 1990. This percentage is going to be used in calculating the incremental energy consumption benefit.

13.4 PROJECT COSTS

13.4.1 Construction Costs

The construction costs of the short-term plan are shown in Section 12.3 of Chapter 12. As these costs incorporate price escalation factor in the contingency item, it has been deducted. The table below shows the Tanzanian Shilling equivalent of the construction costs so obtained. The reason for removing the price escalation factor is as stated in Section 13.3-(3) of this Chapter.

Construction Costs

(Unit: Million T. Shs.)

	1994	1996	Total
Major Portion (Foreign Currency)	5,526.6	6,050.4	11,577.0
Major Portion (Local Currency)	330.2	356.7	686.9
Sub-total	(5,856.8)	(6,407.1)	(12,263.9)
Excl. price escalation	Δ254.6	Δ278.6	Δ533.2
Major Portion Total (A)	5,602.2	6,128.5	11,730.7
Tanzania portion (Local Currency) (B)	261.5	340.5	602.0
Grand Total (A + B)	5,863.7	6,469.0	12,332.7

Δ means minus

13.4.2 Adjustment of Construction Costs

As stated in Section 13.2.3, all transfer items incorporated in market prices such as taxes and subsidies are adjusted (taxes are deducted from and subsidies added to market prices). In this analysis, it was assumed that the materials and equipment costs as well as the transportation costs in the local currency portion include the statutory 25% sales tax, and the relative amount was deducted from the costs. The details are as shown in the following table.

It was assumed, furthermore, that the rest of the local currency portion consists mainly of labor costs. As there is little ground for any adjustment of these costs, no adjustments were made in this analysis.

Adjustment of Construction Costs

(Unit: Million T. Shs.)

		Before Adjustment	After Adjustment	Difference
1994	132 kV Construction Costs	22.9	19.2	3.7
	33 kV Construction Costs	14.5	12.2	2.3
	Substation Foundation Construction Costs	220.0	184.8	35.2
	11 kV Construction Costs	17.0	14.3	2.7
	Transport Costs	46.1	36.9	9.2
	Total	320.5	267.4	53.1
1996	132 kV Construction Costs	25.0	21.0	4.0
	33 kV Construction Costs	30.0	25.2	4.8
	Substation Foundation Construction Costs	209.0	175.6	33.4
	11 kV Construction Costs	51.0	42.8	8.2
	Transport Costs	50.5	40.4	10.1
	Total	365.5	305.0	60.5

It was assumed in the above calculations that 80% of the construction costs are materials and equipment costs. As to the transport costs, it was deemed that the whole amount is subject to the statutory sales tax.

13.4.3 Operation and Maintenance Costs

Statistics suggest that operation and maintenance costs of transmission, substation and distribution divisions generally amount to about 3% of the investment amount. This rate has been adopted in this analysis and has been applied to the construction costs after adjustment.

For the construction years 1994 and 1996, however, it is assumed that the construction costs are evenly spread out throughout the

year and that the amount of the facilities to be maintained and operated is half the construction costs.

13.4.4 Land Costs

The table below gives the costs associated with the acquisition of land. These costs have been obtained from TANESCO.

Land Costs

(Million T. Shs.)

	Compensation Costs (Million T. Shs.)	Rental Fees (T. Shs./Year)
Tandale S/S	10.0	25,400
Chang'ombe S/S	-	18,160
Kunduchi S/S	-	12,100
Kariakoo S/S	-	30,200
Mbagala S/S	0.5	48,400
Tabata S/S	0.01	16,900
132 kV Ubungo-FZ III	40.0 - 50.0	-
33 kV, 11 kV	-	-

- means insignificant or not applicable.

The compensation costs given above are included in the construction costs previously stated. The rental fees are to be enumerated as new cost items.

13.5 BENEFITS

13.5.1 Kinds of Benefits

The following benefits are expected to arise under this Project.

(1) Increase of energy consumption

(2) Reduction of power losses

(3) Reduction of power failures due to accidents

(4) Reduction of operation and maintenance costs due to the upgrading and improvement of the existing facilities

(5) Reduction of damages to electrical apparatus as a result of voltage and frequency stabilization

(6) Improvement of facility in the nation's livelihood as a result of reduced accidental power failures

Out of the benefits enumerated above, however, items (5) and (6) are difficult to quantify. These are therefore not included in this analysis.

The following sections expound the benefits given under items (1) through (4) above.

13.5.2 Increase of Energy Consumption

The electricity demand forecast for Dar Es Salaam is developed in Volume I, Chapter 4. Table 4.2-(4) of that chapter gives specific figures of demand forecast for the future.

Although the present short-term plan envisages only partial improvement of the power supply system of the city, every part of the system is closely related with each other so that even partial improvement of the system will have a beneficial effect on the system as a whole.

It is therefore possible to assume that the implementation of this short-term plan will meet the increased demand forecasted in Table 4.2-4 until 1998, when the next phase construction is to be undertaken.

Table 13.5-1 gives the energy volume consumable by end users calculated under the above assumptions. The table gives both pre-improvement and post-improvement energy quantities at end users, the difference between these two being reduced power losses and reduced accidental power failures consequent upon the implementation of the Project. These two benefits are to be enumerated separately from the increase of electricity consumption and will be discussed in the subsequent sections. The increased energy con-

sumption in this analysis refers to the energy quantity at end users prior to improvement.

The electricity price applicable to the calculations of benefit amount of increased energy consumption was mentioned in Section 13.3-(6).

13.5.3 Reduction of Power Losses

Section 10.6.4-(1) of Chapter 10 studies the reduction of power losses and the results are presented in Table 10.6.4-1. This analysis uses the values given in this table. It was supposed, however, that half the annual volume of reduction will be achieved in the construction years and that the volume of reduction will remain unchanged from 1997 onwards.

The electricity price to be used is same as that mentioned in Section 13.5.2.

13.5.4 Reduction of Accidental Power Failures

Section 10.6.4-(2) of Chapter 10 studies the reduction of accidental power failures and the results are presented in Table 10.6.4-1. This reduction is enumerated as a benefit by the same method as that employed for the reduction of power losses.

13.5.5 Reduction of Operation and Maintenance Costs

This benefit has already been discussed in Section 13.2.1.

As to the present Project, the upgrading and improvement costs associated with savings of the operation and maintenance costs of the existing facilities are as stated in Table 13.5-2.

Table 13.5-2 Upgrading and Improvement Costs for Existing Facilities

(Unit: Million T.Shs.)

Year	Item	Major Portion		
		Foreign Currency	Local Currency	Total
1994	. Kurasini Substation 33 kV incoming line construction	67.7	2.6	70.3
	. Primary and secondary transformers and Bus modification	351.3	20.8	372.1
	. Ilala Substation SCADA Modification and repair	109.3	7.8	117.1
	. Ilala Substation CVMAZV replacement	2.9	0.1	3.0
	. Mbezi Substation VCMAZV replacement	7.8	0.2	8.0
	. 33 kV Tandale Line Upgrading	19.8	1.3	21.1
	Total	558.8	32.8	591.6
1996	. Kurasini Substation 33 kV Line incoming line construction	65.1	2.6	67.7
	. FZ III Substation Primary and Secondary transformers and Bus modification	374.7	20.8	395.5
	. Ilala Substation SCADA Modification and repair	75.5	2.6	78.1
	. Kunduchi Substation ACSR replacement	32.5	2.8	35.3
	. Mbagala Substation ACSR removal and replacement	6.0	0.5	6.5
	Total	553.8	29.3	583.1
	Grand Total	1,112.6	62.1	1,174.7

For these construction works, it has been assumed that they will lead to future savings in the operation and maintenance costs of the existing facilities, and 3% of the construction costs was counted as benefit. The benefit amounts in the construction years, however, were deemed to be half of the normal years, and that the benefit amount will not change from 1997 onwards.

13.6 RESULTS OF ANALYSIS

13.6.1 Economic Internal Rate of Return (EIRR)

The costs and benefits described above as well as their differences are presented for each year in Table 13.6-1. The EIRR obtained from the Net Flow as described in Section 13.2.3 showed the following rate.

EIRR = 20.8%

13.6.2 Sensitivity Analysis

Sensitivity analyses were conducted for the following three costs: 1) 10% increase of the construction costs, 2) 10% decrease of the benefit amounts and 3) simultaneous occurrence of both cases. The results were as follows:

	EIRR
10% increase in construction costs	18.4%
10% decrease in benefit amounts	18.2%
Simultaneous occurrence of both	16.0%

It is to be noted that the benefit of saving operation and maintenance costs increase or decrease in proportion to the increase or decrease of the construction costs. This factor was incorporated in the above sensitivity analyses, and the said benefit was increased in cases 1) and 3) and was kept unchanged in case 2).

13.7 EVALUATION

According to TANESCO, the social discount rate in Tanzania is around 12%. This is almost same with the discount rates used by international aid organizations such as the World Bank as their project evaluation indices.

The EIRR 20.8% of this Project is well in excess of the social discount rate in Tanzania, which indicates that the Project is economically feasible. Even in the worst case assumed in the sensitivity analyses, it is observed that the EIRR remains at 16.0% keeping the Project still well feasible in economic terms.

As stated in Section 13.5.1, there are such unquantifiable benefits, in addition to those already counted, as deduction of damages to electrical aparatus or improvement of the nation's livelihood, etc.

In view of this, it leads to the conclusion that the economic viability of the Project is judged to be higher than the FIRR and is therefore well worth implementing.

Table 13.5-1 Incremental Energy Demand at End Users

	1993	1994	1995	1996	1997	1998-2018
Maximum load (kW)	142,054	150,150	158,858	169,470	179,300	189,341
Incremental portion (compared with 1993)	-	8,096	16,804	27,416	37,246	47,287
Incremental portion after adjustment (Note 1)	-	4,048	16,804	22,110	37,246	42,267
Load (66% load factor)	-	2,672	11,091	14,593	24,582	27,896
Power sent from substations (GWh/year)	-	23.4	97.2	127.8	215.3	244.4
(Pre-improvement) Power loss rate (Note 2)	-	(4.5%)	(4.8%)	(5.1%)	(5.1%)	(5.1%)
(Pre-improvement) Power loss volume (GWh/year)	-	1.6	7.1	9.9	16.6	18.9
(Pre-improvement) Accidental power failures (GWh/year)	-	0.2	0.5	0.6	0.8	0.8
(Pre-improvement) Enercy demand at end users (GWh/year) (Note 3)	-	21.6	89.6	117.3	197.9	224.7
Reduction of power loss (for incremental portion) (GWh/year)	-	0.2	1.3	2.0	3.8	3.8
Reduction of power loss (for base portion)(GWh/year)	-	5.8	10.8	13.1	14.4	14.4
Reductionof power loss - Total		6.0	12.1	15.1	18.2	18.2
Reduction of accidental power failures (GWh/year)	-	0.1	0.1	0.2	0.2	0.2
(Post-improvement) Energy demand at end users (GWh/year)	-	27.7	101.8	132.6	216.3	243.1

Note 1: In the construction years (1994, 1996 and 1998), half of the incremental portion was attributed to the Project.
Note 2: Ratio against the incremental portion after adjustment.
Note 3: The terms "pre-improvement" and "post-improvement" are used to differentiate the situations before and after generation of the reduction of power losses and accidental power failures.

Table 13.6-1 Calculation of Economic Internal Rate of Return (EIRR)

(Million T.Shs.)

Item	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cost																
Investm't Total		5810.6		6408.5												
Basic Portion		5602.2		6128.5												
Tan'nia P'tion		261.5		340.5												
L'cal C'cy Adj.		-53.1		-60.5												
Operat. & Maint.		87.2	174.3	270.4	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6
Land Rental Fee		0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cost Total		5897.8	174.3	6679.0	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8
Benefit																
Add.En'gy Consmp.		221.1	917.3	1200.9	2026.0	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4
Sav.En'gy Loss		175.5	353.9	441.7	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4
Sav.Acci.Pow.Fail		2.9	2.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Sav.Op.&M'nt.Cost		8.9	17.7	26.5	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2
Benefit Total		408.4	1291.8	1675.0	2599.5	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9
Net Flow		-5489.4	1117.5	-5004.0	2232.7	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1
EIRR		0.20759														

Item	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	合計
Cost											
Investm't Total											12219.1
Basic Portion											11730.7
Tan'nia P'tion											602.0
L'cal C'cy Adj.											-113.6
Operat. & Maint.	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	366.6	8596.5
Land Rental Fee	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4.5
Cost Total	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	366.8	20820.1
Benefit											
Add.En'gy Consmp.	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	2300.4	52673.7
Sav.En'gy Loss	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	532.4	12683.9
Sav.Acci.Pow.Fail	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	141.5
Sav.Op.&M'nt.Cost	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	35.2	827.5
Benefit Total	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	2873.9	66326.6
Net Flow	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	2507.1	45506.5
EIRR											

CHAPTER 14

FINANCIAL ANALYSIS

Chapter 14 Financial Analysis

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CHAPTER 14 FINANCIAL ANALYSIS

14.1 PURPOSE OF FINANCIAL ANALYSIS

While economic analysis is intended to examine the feasibility of a project from the viewpoint of national economy, financial analysis is conducted to run a diagnostic check on the profitability of a project from the standpoint of the enterprise that undertakes it. Needless to say, in this project that enterprise is TANESCO.

An enterprise is required to strengthen its financial base by making enough profit in order not only to recover the cost of a project, but also to continue its activities in the future. No matter how important the project is from the standpoint of the nation, there is little likelihood of receiving quality service in the future from the enterprise that undertakes the project if the enterprise suffers loss from that project because of poor financial profitability.

In this sense a project is required to be not only economically feasible, but also financially sound. This is particularly true when a project is undertaken not by the government itself, but by an independent enterprise.

14.2 METHOD OF FINANCIAL ANALYSIS

14.2.1 Difference between Financial Analysis and Economic Analysis

While "costs and benefits adjusted to economic values" were used in economic analysis, actual costs and income are used in financial analysis without such adjustment. In other words, economic analysis is a theoretical and conceptual analysis intended to include even invisible elements in the analysis; whereas financial analysis is a practical analysis intended to deal with the visible elements only.

In this financial analysis, therefore, no adjustment of construction costs as conducted in economic analysis is undertaken, and the

decrease of operation and maintenance costs, which is counted as a benefit in economic analysis, is not counted as income under financial analysis. Although the latter factor should affect the financial state of TANESCO in reality, it has not been incorporated in the financial analysis because how to deal with it on the account books depends on TANESCO's policy.

Another important point to be noted in terms of the difference between financial and economic analysis is that the electricity prices to be applied differ from each other. As stated in Section 13.3-(6) of the preceding chapter, a rate considered to be approximate to the LRMC has been applied in the economic analysis, but in the financial analysis, T. Shs. 19.29/KWH - which appears to be the actual average electricity price as of 1992 - is to be applied.

14.2.2 Method of Analysis

The methods set forth below are utilized in this analysis.

(1) Profit and Loss Accounting and Cash Flow Analysis

(a) The ratios (earning ratios) of operating profit to operating fixed assets are calculated and evaluated. Operating profit is obtained by subtracting operating expenses from operating income. Operating profit makes interest to be paid and net income or loss of an enterprise.

(b) The allowable interest rate on loans is calculated from the ordinary period of repayment for loans and the amount of the source of repayment accumulated during the said period. The source of repayment in this case is equal to the sum of operating profit and depreciation amount.

(c) Profit and loss and cash flow are calculated based on the above interest on loans.

(2) Calculation of Financial Internal Rate of Return (FIRR)

The so-called "Financial Internal Rate of Return (FIRR)" is calculated. This is a rate which equalizes the present worth of the cost stream with that of the income stream, both projected throughout the calculation period. This is then evaluated in comparison with the social discount rate.

Incremental analysis is introduced in the financial analysis like in the economic analysis. This financial analysis is not, therefore, an overall analysis of TANESCO's financial state.

14.3 PREREQUISITES

The assumptions for economic analysis as well as the ratio of operation and maintenance costs mentioned in Section 13.3 and Section 13.4.3 respectively shall also apply to this financial analysis.

The other assumptions are as set forth below.

(1) Depreciation Costs

Depreciation of the facilities to be introduced under this project shall be completed by the year 2018 based on the assumption mentioned in Sectiomn 13.3-(2). The straight line method without residual value shall be used as the depreciation method in accordance with the financial standard of TANESCO.

(2) Allotment of General Administrative Expenses

According to TANESCO, the execution of works under this project involves practically no increase in personnel expenses and overhead expenses at headquarters. Therefore no general administrative expenses shall be included in the operating expenses of this project.

(3) Raising of Funds

Construction costs under this project is provisionally divided into a major portion and a portion to be executed by the Tanzanian side. It has been assumed that the funds for the former will come from a for-

eign loan, while those for the latter will be raised domestically. It has also been assumed that the interest rate for this domestic financing will be 30% per annum and the principal will be repaid over a period of 13 years after completion of construction. The foreign loan, it is assumed, will be repaid over a period of 22 years (from 1997, the year subsequent to completion of construction, till 2018, the final year of the calculation period). With regard to the interest rate, the maximum interest rate that the project can afford to pay is calculated back from the project revenue, as stated later.

14.4 CONSTRUCTION COSTS AND OPERATING EXPENSES

14.4.1 Construction Costs

The construction costs given in Section 13.4.1 of the preceding chapter are used unmodified.

14.4.2 Operating Expenses

Operation and maintenance costs, compensation costs for land, and land rental fees are enumerated in similar manner as described in Sections 13.4.3 and 13.4.4 of the preceding chapter. The construction costs to be counted in calculating the FIRR of this project shall be replaced by depreciation costs in calculating profit and loss. The method of depreciation has been stated in Section 14.3-(1).

14.5 REVENUE AND EXPENDITURE

14.5.1 Income from Increase of Energy Consumption (Operating Revenue)

This is obtained by multiplying incremental energy demand at end users by the mean electricity price. The (post-improvement) energy demand at end users specified in Table 13.5-1 of the preceding chapter shall be applied for the former, and T. Shs. 19.29/kWH specified in Section 14.2.1 of this chapter shall be used for the latter. As a consequence, the incremental income can be calculated as shown in the following table (the share rate of 35% for the

transmission, substation and distribution divisions has been taken into account).

	1994	1995	1996	1997	1998-2018
Incremental Energy Demand (GWH/Year)	27.7	101.8	132.6	216.3	243.1
Incremental Income (Million T. Shs.)	187.0	687.3	895.3	1,460.3	1,641.3

14.5.2 Operating Profit

Operating profit is obtained by subtracting the operating expenses from the operating income in Section 14.5.1 above. The result of calculation is as per Table 14.5-1. In this table, the ratios of the operating profit to the operating fixed assets are calculated, and are shown as average profit ratios.

14.5.3 Loan Repayment Schedule

The funds needed for the Project shall be borrowed in accordance with the preconditions provided in Section 14.3-(3). The repayment of loans starts in 1997 - the year subsequent to completion of the construction works, but the interest on loans during construction is paid at the end of each year during the same period. However, the average loan balances in the construction years shall be half of the construction costs as far as the loan for those years are concerned on the assumption that the construction works will be executed evenly throughout the year. Meanwhile, the amount of repayment of loan and payment of interest after 1997 onwards shall be equal in their total every year.

The schedule of loan repayment for the Tanzania portion can be laid automatically, because its interest on loans is fixed to be 30% p.a. and the period of repayment 22 years. As for the major portion, the period of repayment has been fixed to be 22 years, but the interest rate on loans is not decided yet.

The upper limit of the interest rate that the earnings of this project can afford is calculated back as described below.

The source of payment/repayment of the principal and interest pertaining to the major portion is obtained in the following manner (Unit: Million T. Shs.):

Source of (Re)payment = (Operating profit + Depreciation costs) - (Interest on loans for the Tanzania portion during construction + Principal and interest payable after completion of the said portiion + Net profit to be secured by TANESCO) = (16,683.6 + 12,332.7) - (247.2 + 2,428.0 + 4,430.7) = 21,910.4.

In the above calculation, the net profit to be secured by TANESCO was arranged to be 3% of 147,689.7 million T. Shs., which is the accumulated operating fixed assets as of 2018 - final year of calculation period. The ground for this percentage is that the said profit ratio of electric enterprises in many countries is around 3%, and this level of net profit is thought to be required for the sound management of TANESCO as well.

Now, the upper limit of the interest rate is calculated from the above source of repayment as shown in the following.

Annual average payment of principal and interest
= 21,910.4 million T. Shs. divided by 22 years
= 995.9 million T. Shs.

Ratio of the above to the construction costs of the major portion (11,730.7 million T. Shs.)
= 995.9 divided by 11,730.7 = 0.084897 (Capital recovery ratio)

Assuming that the interest rate on loans for the major portion is i, the following formula becomes valid:

$$\frac{i\,(1+i)^{22}}{(1+i)^{22}-1} = 0.084897$$

where;
i = 6.3%.

However, it must be noted that the interest on loans during construction for the major portion will also have to be paid from the above source of repayment. Supposing the interest rate on loans during construction is 6.3%, the interest amount during construction reaches a total of 1,075.4 million T. Shs. It follows from the above that the amount to be appropriated for the payment of the principal and interest after completion of the construction work is 20,835.0 million T. Shs. after subtracting 1,075.4 million T. Shs. from the initial source amount.

The interest rate obtained from this amount is;

Final upper limit interest rate = 5.678%

Table 14.5-2 shows the overall repayment schedule that has been prepared by utilizing this rate of interest.

14.5.4 Revenue and Expenditure Projection

Table 14.5-3 shows the net profit that has been calculated using the above operating income, operating expenses and financial expenses. In the meanwhile, Table 14.5-4 shows the movement of the cash flow, utilizing the said net profit.

14.6 FINANCIAL INTERNAL RATE OF RETURN (FIRR)

As a result of calculating the Financial Internal Rate of Return (FIRR) in Table 14.6-1, the following FIRR has been obtained;

FIRR = 8.7%

For reference, the depreciation costs have not been taken into account in calculating the FIRR.

14.7 SENSITIVITY ANALYSIS

Sensitivity analysis of FIRR was conducted for the following three cases like the economic analysis, and the following results were obtained.

	FIRR
Increase of costs by 10%	7.2%
Decrease of revenue (income) by 10%	7.0%
Simultaneous occurrence of both	5.5%

Furthermore, sensitivity analysis of the upper limit of interest rate has also been conducted for the above three cases. The results are as shown in the following table:

Sensitivity Analysis of Upper Limit of Interest Rate
(Interest on Loans for Major Portion)

	Increase of Costs by 10%	Decrease of Income by 10%	Simultaneous Occurrence of Both Cases
Operating Income (A)	37,697.2	33,927.5	33,927.5
Operating Expenses (B)	23,115.0	21,013.6	23,115.0
Operating Profit (C=A-B)	14,582.2	12,913.9	10,812.5
Depreciation Costs (D)	13,566.0	12,332.7	13,566.0
Disposable Amount (E=C+D)	28,148.2	25,246.6	24,378.5
Local Currency Interest during Construction (F)	272.0	247.2	272.0
Local Currency Repayment of Principal and Interest after Completion of Work (G)	2,670.8	2,428.0	2,670.8
Net Profit to be secured by TANESCO (H)	4,873.8	4,430.7	4,873.8
Source for Repayment of Major Portion of Work (Before Completion of Work) (I=E-F-G-H)	20,331.6	18,140.7	16,561.9
Foreign Currency Interest during Construction (J)	713.5	716.9	338.0
Final source for Repayment of Major Portion (K=I-J)	19,618.1	17,423.8	16,223.9
Upper Limit of Interest Rate	3.5%	3.7%	1.6%

14.8 EVALUATION

While the social discount rate in Tanzania is assumed to be around 12% as was stated in the preceding chapter for economic analysis, the FIRR of this project was calculated as 8.7%. Thus, financially speaking, the profitability of this project is somewhat insufficient.

In the financial statements prepared through this analysis, the average earning ratio (ratio of operating profit to operating fixed assets) shows somewhat high rate of 11.3% in the final year of the calculation period (22nd year after completion of construction work), but it shows only 7.0% in the 10th year and still only 8.5% in the 15th year. Thus, the pace of rising of the earning ratio is observed to be rather sluggish.

Furthermore, the upper limit of the interest rate affordable for foreign loans, if such loans are available, is calculated to be 5.7%, which is a rather low level. In addition, the said upper limit of interest rate further lowers to the level of 1.6% in the sensitivity analysis where it is supposed that the costs increase by 10% and the income decreases by 10%.

In conclusion, it is desirable that the project gets favourable financial cooperation with a low interest rate and a long repayment period to the extent possible.

Table 14.5-1 Operating Profit and its Ratio against Fixed Assets

(Million T.Shs.)

No.	Year	Operating Profit		Operating Expenses							Operating Profit		Fix.Assets in Op.		Av.Prof.
		Annual (A)	Accumu-lated	Op. & Maint.	Depreciation Input'94	Input'96	Yr Total	Accml.	Land Rental	Total (B)	Annual (A)-(B)	Accml. (C)	Annual	Accml. (D)	Ratio (C)/(D)
	1994	187.0	187.0	88.0	0.0	0.0	0.0	0.0	0.0	88.0	99.0	99.0	5863.7	5863.7	1.7%
	1995	687.3	874.3	175.9	244.3	0.0	244.3	244.3	0.0	420.2	267.1	366.1	5619.4	11483.1	3.2%
	1996	895.3	1769.6	272.9	244.3	0.0	244.3	488.6	0.1	517.4	377.9	744.0	11844.1	23327.1	3.2%
1	1997	1460.3	3229.9	370.0	244.3	294.0	538.4	1027.0	0.2	908.5	551.8	1295.8	11305.7	34632.8	3.7%
2	1998	1641.3	4871.2	370.0	244.3	294.0	538.4	1565.4	0.2	908.5	732.8	2028.6	10767.3	45400.2	4.5%
3	1999	1641.3	6512.5	370.0	244.3	294.0	538.4	2103.7	0.2	908.5	732.8	2761.3	10229.0	55629.1	5.0%
4	2000	1641.3	8153.8	370.0	244.3	294.0	538.4	2642.1	0.2	908.5	732.8	3494.1	9690.6	65319.7	5.3%
5	2001	1641.3	9795.1	370.0	244.3	294.0	538.4	3180.5	0.2	908.5	732.8	4226.8	9152.2	74471.9	5.7%
6	2002	1641.3	11436.4	370.0	244.3	294.0	538.4	3718.8	0.2	908.5	732.8	4959.6	8613.9	83085.8	6.0%
7	2003	1641.3	13077.7	370.0	244.3	294.0	538.4	4257.2	0.2	908.5	732.8	5692.3	8075.5	91161.3	6.2%
8	2004	1641.3	14719.0	370.0	244.3	294.0	538.4	4795.6	0.2	908.5	732.8	6425.1	7537.1	98698.4	6.5%
9	2005	1641.3	16360.3	370.0	244.3	294.0	538.4	5333.9	0.2	908.5	732.8	7157.8	6998.8	105697.2	6.8%
10	2006	1641.3	18001.6	370.0	244.3	294.0	538.4	5872.3	0.2	908.5	732.8	7890.6	6460.4	112157.6	7.0%
11	2007	1641.3	19642.9	370.0	244.3	294.0	538.4	6410.7	0.2	908.5	732.8	8623.3	5922.0	118079.6	7.3%
12	2008	1641.3	21284.2	370.0	244.3	294.0	538.4	6949.0	0.2	908.5	732.8	9356.1	5383.7	123463.3	7.6%
13	2009	1641.3	22925.5	370.0	244.3	294.0	538.4	7487.4	0.2	908.5	732.8	10088.8	4845.3	128308.6	7.9%
14	2010	1641.3	24566.8	370.0	244.3	294.0	538.4	8025.8	0.2	908.5	732.8	10821.6	4306.9	132615.5	8.2%
15	2011	1641.3	26208.1	370.0	244.3	294.0	538.4	8564.1	0.2	908.5	732.8	11554.3	3768.6	136384.1	8.5%
16	2012	1641.3	27849.4	370.0	244.3	294.0	538.4	9102.5	0.2	908.5	732.8	12287.1	3230.2	139614.3	8.8%
17	2013	1641.3	29490.7	370.0	244.3	294.0	538.4	9640.9	0.2	908.5	732.8	13019.8	2691.8	142306.1	9.1%
18	2014	1641.3	31132.0	370.0	244.3	294.0	538.4	10179.2	0.2	908.5	732.8	13752.6	2153.5	144459.6	9.5%
19	2015	1641.3	32773.3	370.0	244.3	294.0	538.4	10717.6	0.2	908.5	732.8	14485.3	1615.1	146074.7	9.9%
20	2016	1641.3	34414.6	370.0	244.3	294.0	538.4	11256.0	0.2	908.5	732.8	15218.1	1076.7	147151.4	10.3%
21	2017	1641.3	36055.9	370.0	244.3	294.0	538.4	11794.3	0.2	908.5	732.8	15950.9	538.4	147689.7	10.8%
22	2018	1641.3	37697.2	370.0	244.3	294.0	538.4	12332.7	0.2	908.5	732.8	16683.6	0.0	147689.7	11.3%
	Total	37697.2		8676.4	5863.7	6469.0	12332.7		4.5	21013.6	16683.6				

Table 14.5-2 Repayment Schedule

(Million T.Shs.)

No.	Year	Loan			Repayment Schedule								Remarks
		Major Portion	Tan'nia Portion	Total	Major Portion				Tanzania Portion				
					Int.	Princ.	Int+Prin	L'n Bal	Int.	Princ.	Int+Prin	L'n Bal	
	1994	5602.2	261.5	5863.7									
	1995												
	1996	6128.5	340.5	6469.0				11730.7				602.0	
1	1997				666.0	281.0	947.0	11449.7	180.6	6.2	186.8	595.8	Major Portion
2	1998				650.1	297.0	947.0	11152.7	178.8	8.0	186.8	587.8	(5.7%, Repaym't 22 years)
3	1999				633.2	313.8	947.0	10838.8	176.3	10.4	186.8	577.4	
4	2000				615.4	331.7	947.0	10507.2	173.2	13.5	186.8	563.8	Tanzania Portion
5	2001				596.6	350.5	947.0	10156.7	169.2	17.6	186.8	546.2	(30%, Repaym't 13 years)
6	2002				576.7	370.4	947.0	9786.3	163.9	22.9	186.8	523.3	
7	2003				555.6	391.4	947.0	9394.9	157.0	29.8	186.8	493.6	
8	2004				533.4	413.6	947.0	8981.2	148.1	38.7	186.8	454.9	
9	2005				509.9	437.1	947.0	8544.1	136.5	50.3	186.8	404.6	
10	2006				485.1	462.0	947.0	8082.1	121.4	65.4	186.8	339.2	
11	2007				458.9	488.2	947.0	7594.0	101.8	85.0	186.8	254.2	
12	2008				431.2	515.9	947.0	7078.1	76.3	110.5	186.8	143.7	
13	2009				401.9	545.2	947.0	6532.9	43.1	143.7	186.8	0.0	
14	2010				370.9	576.1	947.0	5956.7					
15	2011				338.2	608.8	947.0	5347.9					
16	2012				303.6	643.4	947.0	4704.5					
17	2013				267.1	679.9	947.0	4024.5					
18	2014				228.5	718.6	947.0	3306.0					
19	2015				187.7	759.3	947.0	2546.6					
20	2016				144.6	802.5	947.0	1744.2					
21	2017				99.0	848.0	947.0	896.1					
22	2018				50.9	896.2	947.0	0.0					
	Total	11730.7	602.0	12332.7	9104.3	11730.7	20835.0		1826.0	602.0	2428.0		

Table 14.5-3 Profit and Loss Statement

(Million T.Shs.)

No.	Year	Op.Rev. (A)	Operating Expenses				Op.Profit (A)-(B)	Financial Expenses					Net Profit	
			Op. & Maint.	Depre-ciation	Land Rental	Total (B)		Int.Dur.Const. MajorP'n	Int.Dur.Const. Tan.P'n	Int.aft.Compl. MajorP'n	Int.aft.Compl. Tan.P'n	Total	Year	Accumu-lation
	1994	187.0	88.0	0.0	0.0	88.0	99.0	176.5	39.2			215.7	-116.7	-116.7
	1995	687.3	175.9	244.3	0.0	420.2	267.1	352.9	78.5			431.4	-164.3	-281.0
	1996	895.3	272.9	244.3	0.1	517.4	377.9	546.0	129.5			675.5	-297.6	-578.6
1	1997	1460.3	370.0	538.4	0.2	908.5	551.8			666.0	180.6	846.6	-294.9	-873.4
2	1998	1641.3	370.0	538.4	0.2	908.5	732.8			650.1	178.8	828.8	-96.1	-969.5
3	1999	1641.3	370.0	538.4	0.2	908.5	732.8			633.2	176.3	809.5	-76.8	-1046.3
4	2000	1641.3	370.0	538.4	0.2	908.5	732.8			615.4	173.2	788.6	-55.8	-1102.1
5	2001	1641.3	370.0	538.4	0.2	908.5	732.8			596.6	169.2	765.7	-33.0	-1135.1
6	2002	1641.3	370.0	538.4	0.2	908.5	732.8			576.7	163.9	740.5	-7.8	-1142.8
7	2003	1641.3	370.0	538.4	0.2	908.5	732.8			555.6	157.0	712.6	20.1	-1122.7
8	2004	1641.3	370.0	538.4	0.2	908.5	732.8			533.4	148.1	681.5	51.3	-1071.4
9	2005	1641.3	370.0	538.4	0.2	908.5	732.8			509.9	136.5	646.4	86.4	-985.1
10	2006	1641.3	370.0	538.4	0.2	908.5	732.8			485.1	121.4	606.5	126.3	-858.8
11	2007	1641.3	370.0	538.4	0.2	908.5	732.8			458.9	101.8	560.6	172.1	-686.6
12	2008	1641.3	370.0	538.4	0.2	908.5	732.8			431.2	76.3	507.4	225.3	-461.3
13	2009	1641.3	370.0	538.4	0.2	908.5	732.8			401.9	43.1	445.0	287.8	-173.5
14	2010	1641.3	370.0	538.4	0.2	908.5	732.8			370.9		370.9	361.8	188.3
15	2011	1641.3	370.0	538.4	0.2	908.5	732.8			338.2		338.2	394.6	582.9
16	2012	1641.3	370.0	538.4	0.2	908.5	732.8			303.6		303.6	429.1	1012.0
17	2013	1641.3	370.0	538.4	0.2	908.5	732.8			267.1		267.1	465.7	1477.7
18	2014	1641.3	370.0	538.4	0.2	908.5	732.8			228.5		228.5	504.3	1981.9
19	2015	1641.3	370.0	538.4	0.2	908.5	732.8			187.7		187.7	545.1	2527.0
20	2016	1641.3	370.0	538.4	0.2	908.5	732.8			144.6		144.6	588.2	3115.2
21	2017	1641.3	370.0	538.4	0.2	908.5	732.8			99.0		99.0	633.7	3748.9
22	2018	1641.3	370.0	538.4	0.2	908.5	732.8			50.9		50.9	681.9	4430.8
	Total	37697.2	8676.4	12332.7	4.5	21013.6	16683.6	1075.4	247.2	9104.3	1826.0	12252.9	4430.8	

Table 14.5-4 Cash Flow Statement

(Million T.Shs.)

No.	Year	Cash Inflow				Cash Outflow				Net Cash Flow	
		Fund Raised	Net Profit	Depre-ciation	Total	Invest-ment	Loan Repaym't MajorP'n	Loan Repaym't Tan.P'n	Total	Annual	Accumu-lated
	1994	5863.7	-116.7	0.0	5747.0	5863.7			5863.7	-116.7	-116.7
	1995		-164.3	244.3	80.0				0.0	80.0	-36.7
	1996	6469.0	-297.6	244.3	6415.8	6469.0			6469.0	-53.2	-89.9
1	1997		-294.9	538.4	243.5		281.0	6.2	287.2	-43.7	-133.6
2	1998		-96.1	538.4	442.3		297.0	8.0	305.0	137.3	3.7
3	1999		-76.8	538.4	461.6		313.8	10.4	324.3	137.3	141.0
4	2000		-55.8	538.4	482.5		331.7	13.5	345.2	137.3	278.3
5	2001		-33.0	538.4	505.4		350.5	17.6	368.1	137.3	415.6
6	2002		-7.8	538.4	530.6		370.4	22.9	393.3	137.3	552.9
7	2003		20.1	538.4	558.5		391.4	29.8	421.2	137.3	690.2
8	2004		51.3	538.4	589.6		413.6	38.7	452.3	137.3	827.5
9	2005		86.4	538.4	624.7		437.1	50.3	487.4	137.3	964.9
10	2006		126.3	538.4	664.6		462.0	65.4	527.3	137.3	1102.2
11	2007		172.1	538.4	710.5		488.2	85.0	573.2	137.3	1239.5
12	2008		225.3	538.4	763.7		515.9	110.5	626.4	137.3	1376.8
13	2009		287.8	538.4	826.2		545.2	143.7	688.8	137.3	1514.1
14	2010		361.8	538.4	900.2		576.1		576.1	324.1	1838.2
15	2011		394.6	538.4	932.9		608.8		608.8	324.1	2162.2
16	2012		429.1	538.4	967.5		643.4		643.4	324.1	2486.3
17	2013		465.7	538.4	1004.0		679.9		679.9	324.1	2810.4
18	2014		504.3	538.4	1042.6		718.6		718.6	324.1	3134.4
19	2015		545.1	538.4	1083.4		759.3		759.3	324.1	3458.5
20	2016		588.2	538.4	1126.5		802.5		802.5	324.1	3782.6
21	2017		633.7	538.4	1172.1		848.0		848.0	324.1	4106.7
22	2018		681.9	538.4	1220.2		896.2		896.2	324.1	4430.7
	Total	12332.7	4430.8	12332.7	29096.2	12332.7	11730.7	602.0	24665.4	4430.7	

Table 14.6-1 Calculation of Financial Internal Rate of Return (FIRR)

(Million T.Shs.)

Item	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Cost																
Investm't Total		5863.7		6469.0												
Basic Portion		5602.2		6128.5												
Tan'nia P'tion		261.5		340.5												
Operat. & Maint.		88.0	175.9	272.9	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0
Land Rental Fee		0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Cost Total		5951.7	175.9	6742.0	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2
Revenue																
Add. En'gy Sold		187.0	687.3	895.3	1460.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3
Revenue Total		187.0	687.3	895.3	1460.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3
Net Flow		-5764.7	511.4	-5846.7	1090.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1
FIRR		0.08710														

Item	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	合計
Cost											
Investm't Total											12332.7
Basic Portion											11730.7
Tan'nia P'tion											602.0
Operat. & Maint.	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	370.0	8676.4
Land Rental Fee	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	4.5
Cost Total	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	370.2	21013.6
Revenue											
Add. En'gy Sold	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	37697.2
Revenue Total	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	1641.3	37697.2
Net Flow	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	1271.1	16683.6
FIRR											