

CHAPTER 13. PROJECT EVALUATION

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	Page
13.1 General	13 – 1
13.2 Energy Cost	13 – 1
13.2.1 Project Cost	13 – 1
13.2.2 Energy Cost	13 – 3
13.3 Economic Analysis	13 – 4
13.3.1 Basic Assumptions	13 – 4
13.3.2 Economic Cost	13 – 5
13.3.3 Economic Benefit	13 – 5
13.3.4 Economic Internal Rate of Return (EIRR)	13 – 8
13.3.5 Sensitivity Analysis	13 – 9
13.4 Financial Analysis	13 – 10
13.4.1 General	13 – 10
13.4.2 Assumptions for Financial Analysis	13 – 10
13.4.3 Financial Cost	13 – 10
13.4.4 Financial Internal Rate of Return (FIRR)	13 – 11
13.4.5 Sensitivity Analysis	13 – 11
13.5 Indirect Project Effects	13 – 12

LIST OF TABLES

Table 13-1	Disbursement Schedule (Stage-1, 201 MW) (Financial Cost)
Table 13-2	Disbursement Schedule (Stage-1, 201 MW) (Economic Cost)
Table 13-3	Disbursement Schedule (Stage-1&2, 402 MW) (Financial Cost)
Table 13-4	Disbursement Schedule (Stage-1&2, 402 MW) (Economic Cost)
Table 13-5	Economic Internal Rate of Return (Stage-1, 201 MW)
Table 13-6	Economic Internal Rate of Return (Stage-1&2, 402 MW)
Table 13-7	Sensitivity Analysis of EIRR (201 MW: Cost +10%)
Table 13-8	Sensitivity Analysis of EIRR (201 MW: Benefit -10%)
Table 13-9	Sensitivity Analysis of EIRR (201 MW: Cost +10%, Benefit -10%)
Table 13-10	Sensitivity Analysis of EIRR (201 MW: Power Export Decrease by 20 MW)
Table 13-11	Sensitivity Analysis of EIRR (402 MW: Cost +10%)
Table 13-12	Sensitivity Analysis of EIRR (402 MW: Benefit -10%)
Table 13-13	Sensitivity Analysis of EIRR (402 MW: Cost +10%, Benefit -10%)
Table 13-14	Sensitivity Analysis of EIRR (402 MW: Power Export Decrease by 20 MW)
Table 13-15	Financial Internal Rate of Return (Stage-1, 201 MW)
Table 13-16	Financial Internal Rate of Return (Stage-1&2, 402 MW)
Table 13-17	Sensitivity Analysis of FIRR (201 MW: Cost +10%)
Table 13-18	Sensitivity Analysis of FIRR (201 MW: Benefit -10%)
Table 13-19	Sensitivity Analysis of FIRR (201 MW: Cost +10%, Benefit -10%)
Table 13-20	Sensitivity Analysis of FIRR (201 MW: Power Export Decrease by 20 MW)
Table 13-21	Sensitivity Analysis of FIRR (402 MW: Cost +10%)
Table 13-22	Sensitivity Analysis of FIRR (402 MW: Benefit -10%)
Table 13-23	Sensitivity Analysis of FIRR (402 MW: Cost +10%, Benefit -10%)
Table 13-24	Sensitivity Analysis of FIRR (402 MW: Power Export Decrease by 20 MW)

CHAPTER 13. PROJECT EVALUATION

13.1 General

To meet the projected load demands for electricity in Nepal after the early 1990s, it is planned to construct the Arun 3 Hydroelectric Power Project on the Arun river. As described in detail in Chapter 2, the project is to be implemented in two stages, i.e. the 1st stage with the installed capacity of 201 MW particularly for load demand in Nepal, and the 2nd stage with the installed capacity of another 201 MW for meeting domestic as well as power export (402 MW in total). The supply of generated energy will be commenced from 8th year after the start of its construction works.

This chapter contains the results of project evaluation of the proposed project in terms of economic, financial and socio-economic aspects. The energy costs at both generation and receiving ends are firstly calculated. Secondly, the economic feasibility is evaluated by calculating the economic internal rate of return (EIRR). Further, sensitivity analysis of the EIRR is made with respect to changes in the project costs and project output. Thirdly, the financial feasibility is evaluated by calculating financial internal rate of return (FIRR). The calculation of the FIRR is to confirm the soundness of the project from the viewpoint of the executing agency. Finally, indirect socio-economic effects of the project are briefly assessed in due consideration of socio-economic importance of the project on national as well as regional development.

13.2 Energy Cost

13.2.1 Project Cost

Project cost consists of construction cost and operation and maintenance cost. Construction cost includes the direct costs for the construction of project facilities such as access road, dam, tunnels, powerhouse, transmission line, substation, etc., and indirect costs such as administration including engineering service and physical contingency. Operation and maintenance costs include the

costs for administration, regular maintenance and repair. Replacement cost for hydraulic and electromechanical equipment is considered in the cost stream at the interval of 25 years after their installation.

For the purpose of benefit-cost analysis of the project, the project costs in both financial and economic prices are determined as follows. Project cost at receiving end which includes the costs for transmission line and substation facilities is regarded as financial cost, and project cost at generation end is regarded as economic cost.

	<u>Financial Cost</u>		<u>Economic Cost</u>	
	Stage-1	Stage-1&2	Stage-1	Stage-1&2
 in million US\$			
Civil Works	179.9	234.6	179.9	234.6
Hydraulic Equipment	11.7	17.6	11.7	17.6
Electromechanical Facilities	38.4	69.4	38.4	69.4
Transmission and Substation	87.5	107.0	-	-
Engineering and Administration	23.8	32.1	17.2	24.1
Physical Contingency	43.1	57.8	33.7	46.3
Total:	384.4	518.5	280.9	392.0

Operation and maintenance cost (O/M cost) is also determined as follows.

	<u>Financial Cost</u>		<u>Economic Cost</u>	
	Stage-1	Stage-1&2	Stage-1	Stage-1&2
 in million US\$			
Annual O/M Cost (at full operation)	4.1	5.7	3.0	4.3

Note: Financial and economic costs mentioned above are estimated at the price level of June 1986.

13.2.2 Energy Cost

Energy cost for the proposed project is estimated as average kWh cost at both generation end and receiving end. The kWh cost is calculated from annual cost (construction plus operation and maintenance costs) divided by annual generated energy. Energy cost of the project is calculated under the following conditions.

	Receiving End (Financial Cost)		Generation End (Economic Cost)	
	Stage-1	Stage-1&2	Stage-1	Stage-1&2
Construction Cost (US\$ mil.) ^{1/}	384.4	518.5	280.9	392.0
C.R.F. (40 years, 12%) ^{2/}	0.121	0.121	0.121	0.121
Annual Construction Cost (US\$ mil.)	46.5	62.7	34.0	47.4
Annual O/M Cost (US\$ mil.)	4.1	5.7	3.0	4.3
Total Annual Cost (US\$ mil.)	50.6	68.4	37.0	51.7
Generated Energy (GWH/year) ^{3/}	1635.5	2816.2	1721.6	2960.3
Energy Cost (US Cent/kWh) ^{4/5/}	3.1	2.4	2.1	1.7

Note: 1/ Costs for transmission line and substation facilities are not included in construction cost at generation end.
Mil. signifies million.

2/ C.R.F. = Capital Recovery Factor. Average lifetime of 40 years is assumed taking into consideration the lifetime of 50 years for civil works related facilities and that of 25 years for hydraulic and electromechanical equipment.
C.R.F. for 40 years at the rate of 12% is 0.121.

3/ Transmission loss of 5% is considered at receiving end.

4/ All costs are expressed in June 1986 price level.

5/ This energy cost is calculated on the assumption that all generated energy is consumed from the beginning.

13.3 Economic Analysis

13.3.1 Basic Assumptions

The economic evaluation of the project is made on the basis of the following assumptions.

- (1) Monetary unit and exchange rate: United States Dollar (US\$) is used in cost estimates and benefit calculation. The exchange rate between United States Dollar (US\$) and Nepalese Rupee (Rs) is set at US\$1.00=Rs21.35, which is an official rate as of June 1986.
- (2) Price level: The current prices as of June 1986 are used in the cost estimate.
- (3) Project life: Economic life of project facilities is set at 50 years for civil works related facilities, and 25 years for hydraulic and electromechanical equipment. The cost and benefit are discounted over a period of 57 years including the construction period.
- (4) Benefit: Benefit will arise from 8th year of the project when unit No.1 will commence to supply electricity. Only direct benefit which accrues from the generation of electricity is quantified for the economic analysis. Any indirect benefit such as employment opportunities due to the project and socio-economic impact due to the construction of access road are not valued in monetary terms, but assessed in a qualitative manner in section 13.5.
- (5) IDC: Interest during construction period (IDC) is not included in the cost estimate.
- (6) Price escalation: Escalation of cost and benefit in the future will be in the order of magnitude of overall inflation rates. Therefore, cost and benefit are not escalated in the economic analysis.

13.3.2 Economic Cost

Economic cost is usually derived from the financial cost by deducting transfer payment such as interest, duties and taxes, and by adjusting non-traded financial cost into economic cost using certain conversion factors. In the case of the Arun 3 project, however, the transfer payment shares only 1% of the imported items, and conversion factor adjustment has no significant effects on the economic evaluation due mainly to its low share (14%) of local currency portion in the total cost. Considering these factors, construction cost at generation end at the price level of June 1986 is regarded as economic cost. The total economic investment cost is thus estimated at US\$280.9 million for the 1st stage, and US\$392.0 million for the 1&2 stages. (Economic cost does not include the costs for transmission line and substation facilities.) The disbursement schedules for the 1st stage and the 1&2 stages are presented in Tables 13-1, 13-2, 13-3 and 13-4.

The operation and maintenance costs cover administration costs, regular maintenance costs, and repair costs. The annual O/M costs are estimated to be 1% of direct costs for civil works, and 2% of direct costs for hydraulic and electromechanical equipment. The estimated annual O/M costs for the 1st stage (201 MW) are US\$3.0 million, and for the 1&2 stages (402 MW) US\$4.3 million.

13.3.3 Economic Benefit

(1) Power and Energy Output

Direct benefit of the project arises from an increased generation of energy to be consumed within Nepal or to be exported to other country until the power market in Nepal is developed. The output of the Arun 3 project is summarized as follows.

Power and Energy Output of Arun 3

Year	Installed Capacity (MW)	Useful Capacity (MW)	Generated Energy (GWH/Year)	
			Stage-1	Stage-1&2
1994	134	52.0	1159.7	1159.7
1995	134	69.0	1159.7	1159.7
1996	134	86.1	1159.7	1159.7
1997	134	104.2	1159.7	1159.7
1998	134	123.2	1159.7	1159.7
1999	402	143.0	1721.6	2960.3
2000	402	163.7	1721.6	2960.3
2001	402	185.4	1721.6	2960.3
2002	402	208.3	1721.6	2960.3
2003	402	232.3	1721.6	2960.3
2004	402	257.5	1721.6	2960.3
2005	402	283.8	1721.6	2960.3
2006	402	311.3	1721.6	2960.3
2007	402	340.1	1721.6	2960.3
2008-43	402	354.0	1721.6	2960.3

Generated energy as mentioned above could further be classified into salable domestic, salable export and surplus energy in due consideration of electricity demand. Classification of generated energy is presented below.

Classification of Generated Energy
(Stage-1&2 402 MW)

Unit: GWh/Year

Year	Domestic Use <u>1/</u>	For Export	Surplus Energy	Total
1994	179	0	980.7	1159.7
1995	256	0	903.7	1159.7
1996	333	0	826.7	1159.7
1997	415	0	744.7	1159.7
1998	500	0	659.7	1159.7
1999	588	2372.3	0	2960.3
2000	680	2280.3	0	2960.3
2001	776	2184.3	0	2960.3
2002	876	2084.3	0	2960.3
2003	980	1980.3	0	2960.3
2004	1089	1871.3	0	2960.3
2005	1201	1759.3	0	2960.3
2006	1318	1642.3	0	2960.3
2007	1440	1520.3	0	2960.3
2008	1567	1393.3	0	2960.3
2009	1699	1261.3	0	2960.3
2010	1837	1123.3	0	2960.3
2011-43	1863.2	1097.1	0	2960.3

1/ Domestic use energy includes 103 GWh/Year of the yearly committed export energy.

(2) Unit Value of Project Output

Benefit of the project is calculated from project output mentioned above multiplied by unit value of each output. Unit values of project output are mainly derived from the long run marginal cost (LRMC) of electricity generation as reported in the then Electricity Department report "Long Run Marginal Costs of Electricity Generation in Nepal", December 1984. The report was reviewed, and it was concluded that LRMC is properly derived and can be appropriately utilized in the project evaluation.

As the said unit values based on LRMC are expressed in 1984 price level, these are updated using the inflation rate of 6% per annum. As to kWh value of export energy, the expected export rate of 4.8 US cent is applied. These values, based on a 12% discount rate at the price level of June 1986, are summarized below.

kW value (capacity)	US\$68/kW/year
kWh value (domestic)	6.3 US cent/kWh/year
kWh value (export)	4.8 US cent/kWh/year
kWh value (surplus)	0.5 US cent/kWh/year

Note: 1. Annual inflation rate of 6% is estimated from the following reports: 1) Nepal - Prospects for Economic Adjustment and Growth, 1985, World Bank; and 2) Country Report (India, Nepal, No. 4 1986), the Economic Intelligence Unit.

2. The long run marginal costs of electricity generation described above are the costs at the generation site.

13.3.4 Economic Internal Rate of Return (EIRR)

The cash flows of the economic cost and benefit of the project are prepared based on the project implementation schedule. Cash flows of two cases, i.e. the 1st stage (201 MW) and the 1&2 stages (402 MW) are prepared and discounted over a period of 57 years. The economic internal rate of return (EIRR) is that discount rate which when applied to the cost benefit streams, will make the benefit cost ratio (B/C) equals to 1 and net present value (B-C) equals to zero. The calculated EIRRs for the 1st stage (201 MW) and the 1&2 stages (402 MW) are as follows. B/C at 12% discount rate is also presented below. (The details of calculation are presented in Tables 13-5 and 13-6.)

	<u>EIRR (%)</u>	<u>B/C</u>
Stage-1 (201 MW)	15.5	1.5
Stage-1&2 (402 MW)	19.5	2.1

As the result of the calculation, both cases of the 1st stage and the 1&2 stages indicate the economic soundness of the project as

the EIRRs exceed 12% discount rate which is considered to be the opportunity cost of capital in Nepal.

13.3.5 Sensitivity Analysis

In order to evaluate the soundness of the project to the possible changes of economic conditions in the future, the sensitivity analysis has been made for the following critical conditions in terms of internal rate of return.

- (1) Construction cost is increased by 10%.
- (2) Benefit is decreased by 10%.
- (3) Combination of (1) and (2) above.
- (4) Decrease in benefit because of anticipated export (20 MW) being not realized.

Based on the conditions outlined above, sensitivity of the EIRR is calculated as follows.

Assumptions	EIRR (%)	
	Stage-1	Stage-1&2
(1) 10% increase in construction cost	14.7	18.5
(2) 10% decrease in benefit	14.5	18.3
(3) Combination of (1) and (2)	13.6	17.3
(4) Decrease in benefit due to anticipated export (20 MW) being not realized	14.5	18.8

It is clear from the above that both cases (Stage-1 and Stage-1&2) indicate the economic soundness even in the adverse conditions of 10% increase in construction cost, 10% decrease in benefit and the combination of the two. The EIRR of the worst case, i.e. 10% increase in construction cost plus 10% decrease in benefit in the 1st stage, is 13.6% which also exceed the opportunity cost of capital in Nepal. The results of the calculation are presented in Tables 13-7 to 13-12.

13.4 Financial Analysis

13.4.1 General

The objective of financial analysis is to confirm the soundness of the project from the viewpoint of the executing agency. Cash flows of financial cost (expenditure) and financial benefit (revenue) are prepared and discounted over a period of project life. The discounted cost and benefit are compared and expressed as financial internal rate of return (FIRR). Financial cost of the project is the construction cost at receiving end estimated at the price level of June 1986, which includes the cost for transmission line and substation facilities. Financial cost thus estimated is not identical to the actual construction cost as financial cost does not cover such costs as interest during construction period and price contingency. Financial benefit is the revenue of the executing agency which is derived from sales of incremental generation of electricity.

13.4.2 Assumptions for Financial Analysis

Basic assumptions for financial analysis such as monetary unit, exchange rate, price level, project life, IDC, and price escalation are the same as the case in economic analysis except estimation of benefit. Financial benefit of the project is the revenue of the executing agency, i.e. NEA, which accrues from the sale of incremental generation of electricity. Unit value of electricity is estimated to be 5.6 US cent per kWh for domestic use based on the average revenue per kWh sold (Source: Revenue Record of Finance Dept., NEA) and 4.8 US cent per kWh for export energy which is the expected power exchange rate with India.

13.4.3 Financial Cost

Financial cost of the project is estimated at the price level of June 1986 when the feasibility study was conducted in Nepal. Financial cost includes the direct costs for the construction of access road, dam, tunnels, powerhouse, transmission line, substa-

tion, etc., and indirect cost for administration including engineering services, and physical contingency. Operation and maintenance cost covers the costs for administration, regular maintenance and repairs including the cost for maintenance of transmission line and substation facilities. Replacement cost for transmission line and electromechanical equipment is included in the premise that the economic lifetime of transmission line and electromechanical equipment is 25 years and that after 25 years they will not have any residual values.

13.4.4 Financial Internal Rate of Return (FIRR)

Cash flows of financial cost and benefit are prepared for the two cases, i.e., the 1st stage (201 MW) and the 1&2 stages (402 MW). Then, the cost and benefit streams are discounted over a period of 57 years for both the two cases. The result of the calculation is presented below, and the details of the calculation are shown in Tables 13-13 and 13-14.

	<u>FIRR (%)</u>
Stage-1 (201 MW)	10.8
Stage-1&2 (402 MW)	14.9

The above result indicates the financial viability of the project in the sense that the project has enough return to pay the interest rate in the case of the project's financing sources being sought from foreign countries or from international lending institutions.

13.4.5 Sensitivity Analysis

Sensitivity analysis has been made on the FIRR calculated in the preceding section in order to evaluate the financial viability for the critical conditions as mentioned below.

- (1) Construction cost is increased by 10%.
- (2) Benefit is decreased by 10%.
- (3) Combination of (1) and (2) above.

- (4) Benefit is decreased by anticipated export (20 MW) being not realized.

Based on the conditions outlined above, sensitivity of the FIRR is calculated as follows.

Assumptions	Stage-1	Stage-1&2
(1) 10% increase in construction cost	10.1	14.0
(2) 10% decrease in benefit	10.0	13.9
(3) Combination of (1) and (2)	9.4	13.0
(4) Decrease in benefit due to anticipated export (20 MW) being not realized.	10.0	14.5

It is clear from the above that both cases (Stage-1 and Stage-1&2) indicate the financial viability even in the adverse conditions of 10% increase in construction cost, 10% decrease in benefit and the combination of the two. The details of calculation are shown in Tables 13-15 - 13-20.

13.5 Indirect Project Effects

In addition to the direct benefit as described in the preceding sections, indirect socio-economic effects are expected to arise as a result of implementation of the project. Although numerical valuation of such indirect effects is difficult, every effort was made to assess these factors as far as possible in view of their significant importance to national as well as regional development.

(1) Contribution to National Economy

Increased generation of electricity will make it possible to supply stable energy source to consumers within Nepal, enabling domestic, industrial and commercial consumers to use stable energy at relatively lower prices than other identified hydro electric project. Thus, it is expected that activities in industrial as well as commercial sectors will be greatly promoted.

(2) Saving of Imported Fuel

The project will make it possible to conserve the consumption of imported fuel which would have been required to run the existing or new diesel stations to meet the load growth in the absence of Arun 3 project.

(3) Creation of New Job Opportunities

Civil works for the project would create new jobs for skilled and unskilled labourers during the implementation period. After project completion, jobs would be generated by maintenance of the project facilities. Furthermore, the employees will be able to gain more experience, technical know-how, and skillfulness in the various fields. The accumulation of these experience would be applied to the future development in Nepal

(4) Improved Transportation

The local transportation system in the Kosi Zone will be much improved by the construction of access road from Hile to the project site in the Sankhuwasabha District. The road system will not only enhance the economic activity in the project area, but also contribute to interregional accessibility and communications.

(5) Activation of Local Economy

Local economy will be greatly activated by the implementation of the project through creation of new job opportunities, improved transportation, improved communications, increased income, and other various factors.

(6) Stimulation to Development of Arun River Basin

As reported in the Kosi Basin Master Plan which was prepared by JICA in 1985, six hydropower project sites were identified in the course of the Arun river. By construction of the access road to Arun 3 project site, the development of prospective hydropower sites in the Arun river basin will be enhanced as the existence of the said access road will make it possible to

construct the new hydropower projects at lower expenses due to its better accessibility.

(7) Stimulation to Tourism Industry

A large portion of the access road will be utilized as trunk road in the Kosi Zone. There is possibility that the new road which will connect Biratnagar to the border of China would be constructed in the future. There is great possibility, therefore, that tourism industry in this region would be developed and associated new jobs would be created in the future.

Table 13-1 Disbursement Schedule (Stage-1, 201 MW)
(Financial Cost)

unit: million US\$

	Cost	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Civil Works	179.9	3.9	15.9	16.7	18.4	35.0	39.6	35.8	13.7	0	0	0	0	0.6	0.4	0
Hydraulic Equipment	11.7	0	0	0	0	1.2	2.3	4.7	3.5	0	0	0	0	0	0	0
Electromechanical Equipment	38.4	0	0	0	0	2.9	11.6	8.7	5.8	0	0	4.7	3.8	0.9	0	0
Transmission Line and Substation	87.5	0	0	0	0	0	7.9	47.3	23.7	0	0	0	5.2	3.4	0	0
Base Cost	317.5	3.9	15.9	16.7	18.4	39.1	61.4	96.6	46.7	0	0	4.7	9.5	4.7	0	0
Engineering & Administration	23.8	0.3	1.2	1.2	1.4	2.9	4.6	7.2	3.5	0	0	0.4	0.7	0.4	0	0
Physical Contingency	43.1	0.6	2.5	2.6	2.9	5.9	8.6	12.2	5.7	0	0	0.5	1.0	0.5	0	0
Total	384.4	4.8	19.6	20.6	22.7	48.0	74.5	116.0	55.9	0	0	5.5	11.2	5.6	0	0
O & M Cost		0	0	0	0	0	0	0	2.7	2.7	2.7	2.7	2.7	4.1	4.1	4.1

Table 13-2 Disbursement Schedule (Stage-1, 201 MW)
(Economic Cost)

unit: million US\$

	Cost	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Civil Works	179.9	3.9	15.9	16.7	18.4	35.0	39.6	35.8	13.7	0	0	0	0	0.6	0.4	0
Hydraulic Equipment	11.7	0	0	0	0	1.2	2.3	4.7	3.5	0	0	0	0	0	0	0
Electromechanical Equipment	38.4	0	0	0	0	2.9	11.6	8.7	5.8	0	0	4.7	3.8	0.9	0	0
Transmission Line and Substation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base Cost	230.0	3.9	15.9	16.7	18.4	39.1	53.5	49.2	23.0	0	0	4.7	4.3	1.3	0	0
Engineering & Administration	17.2	0.3	1.2	1.2	1.4	2.9	4.0	3.7	1.7	0	0	0.4	0.3	0.1	0	0
Physical Contingency	33.7	0.6	2.5	2.6	2.9	5.9	7.7	7.1	3.2	0	0	0.5	0.5	0.1	0	0
Total	280.9	4.8	19.6	20.6	22.7	48.0	65.2	60.0	27.9	0	0	5.5	5.1	1.5	0	0
O & M Cost		0	0	0	0	0	0	0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0

Table 13-3 Disbursement Schedule (Stage-1&2, 402 MW)
(Financial Cost)

unit: million US\$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cost														
Civil Works	3.9	15.9	16.7	18.4	35.0	39.6	35.8	18.9	9.8	16.2	18.1	6.0	0.4	0
Hydraulic Equipment	0	0	0	0	1.2	2.3	4.7	3.5	0	0	3.2	2.7	0	0
Electromechanical Equipment	0	0	0	0	2.9	11.6	8.7	5.8	0	0	20.2	16.2	4.0	0
Transmission Line and Substation	0	0	0	0	7.9	47.3	23.7	0	0	16.9	11.2	0	0	0
Base Cost	3.9	15.9	16.7	18.4	39.1	61.4	96.6	51.9	9.8	16.2	58.3	36.0	4.4	0
Engineering & Administration	0.3	1.2	1.2	1.4	2.9	4.6	7.2	3.9	0.7	1.2	4.4	2.7	0.3	0
Physical Contingency	0.6	2.5	2.6	2.9	5.9	8.6	12.2	6.5	1.5	2.6	7.2	4.2	0.5	0
Total	4.8	19.6	20.6	22.7	48.0	74.5	116.0	62.3	12.1	20.0	69.9	42.9	5.2	0
O & M Cost	0	0	0	0	0	0	0	1.9	1.9	1.9	1.9	1.9	5.7	5.7

Table 13-4 Disbursement Schedule (Stage-1&2, 402 MW)
(Economic Cost)

unit: million US\$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Cost														
Civil Works	3.9	15.9	16.7	18.4	35.0	39.6	35.8	18.9	9.8	16.2	18.1	6.0	0.4	0
Hydraulic Equipment	0	0	0	0	1.2	2.3	4.7	3.5	0	0	3.2	2.7	0	0
Electromechanical Equipment	0	0	0	0	2.9	11.6	8.7	5.8	0	0	20.2	16.2	4.0	0
Transmission Line and Substation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base Cost	3.9	15.9	16.7	18.4	39.1	53.5	49.2	28.2	9.8	16.2	41.5	24.8	4.4	0
Engineering & Administration	0.3	1.2	1.2	1.4	2.9	4.0	3.7	2.1	0.7	1.2	3.1	1.9	0.3	0
Physical Contingency	0.6	2.5	2.6	2.9	5.9	7.7	7.1	4.0	1.5	2.6	5.4	3.0	0.5	0
Total	4.8	19.6	20.6	22.7	48.0	65.2	60.0	34.2	12.0	20.0	50.0	29.7	5.2	0
O & M Cost	0	0	0	0	0	0	0	1.9	1.9	1.9	1.9	1.9	4.3	4.3

Table 13-5 Economic Internal Rate of Return
(Stage-1, 201 MW)

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (15.54%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY					
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	0.893	-19.60	0.865	-16.96
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	0.797	-20.60	0.749	-15.43
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	0.712	-22.70	0.648	-14.72
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	0.636	-48.00	0.561	-35.93
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	0.567	-65.20	0.486	-31.66
7	1993	60.00	0.00	60.00	0.00	0.00	0.00	0.00	0.507	-60.00	0.420	-25.22
8	1994	27.80	2.00	29.80	11.30	4.90	19.70	-10.10	0.452	-4.57	0.364	-3.67
9	1995	0.00	2.00	2.00	16.10	4.50	26.50	24.50	0.404	9.90	0.315	7.71
10	1996	0.00	2.00	2.00	21.00	4.10	32.20	30.20	0.361	10.89	0.272	8.23
11	1997	5.50	2.00	7.50	26.20	3.70	38.30	30.80	0.322	9.92	0.236	7.26
12	1998	5.10	2.00	7.10	31.50	3.30	44.50	37.40	0.287	10.75	0.204	7.63
13	1999	1.60	3.00	4.60	37.00	5.70	53.80	49.20	0.257	12.63	0.177	8.69
14	2000	0.00	3.00	3.00	42.80	5.20	60.60	57.60	0.229	13.20	0.153	8.81
15	2001	0.00	3.00	3.00	48.90	4.70	67.30	64.30	0.205	13.16	0.132	8.51
16	2002	0.00	3.00	3.00	55.20	4.20	73.10	70.10	0.183	12.81	0.113	8.03
17	2003	0.00	3.00	3.00	61.70	3.70	79.10	76.10	0.163	12.41	0.099	7.54
18	2004	0.00	3.00	3.00	68.60	3.20	85.50	82.50	0.146	12.02	0.086	7.08
19	2005	0.00	3.00	3.00	75.70	2.50	92.00	89.00	0.130	11.57	0.074	6.61
20	2006	0.00	3.00	3.00	83.00	2.00	98.70	95.70	0.116	11.11	0.064	6.15
21	2007	0.00	3.00	3.00	90.70	1.40	105.80	102.80	0.104	10.66	0.056	5.72
22	2008	0.00	3.00	3.00	98.70	0.80	113.20	110.20	0.093	10.20	0.048	5.30
23	2009	0.00	3.00	3.00	107.00	0.10	120.80	117.80	0.083	9.74	0.042	4.91
24	2010	0.00	3.00	3.00	108.70	0.00	127.70	124.70	0.074	9.28	0.036	4.50
25	2011	0.00	3.00	3.00	108.70	0.00	133.70	130.70	0.066	8.81	0.031	4.10
26	2012	0.00	3.00	3.00	108.70	0.00	139.70	136.70	0.059	8.34	0.027	3.72
27	2013	0.00	3.00	3.00	108.70	0.00	145.70	142.70	0.053	7.87	0.023	3.35
28	2014	0.00	3.00	3.00	108.70	0.00	151.70	148.70	0.047	7.40	0.020	2.99
29	2015	0.00	3.00	3.00	108.70	0.00	157.70	154.70	0.042	6.93	0.018	2.64
30	2016	4.10	3.00	7.10	108.70	0.00	163.70	160.70	0.037	6.46	0.015	2.29
31	2017	13.90	3.00	16.90	108.70	0.00	169.70	166.70	0.033	6.00	0.013	1.95
32	2018	13.40	3.00	16.40	108.70	0.00	175.70	172.70	0.030	5.54	0.011	1.62
33	2019	9.30	3.00	12.30	108.70	0.00	181.70	178.70	0.027	5.09	0.010	1.30
34	2020	0.00	3.00	3.00	108.70	0.00	187.70	184.70	0.024	4.64	0.009	0.99
35	2021	0.00	3.00	3.00	108.70	0.00	193.70	190.70	0.021	4.19	0.007	0.68
36	2022	4.70	3.00	7.70	108.70	0.00	199.70	196.70	0.019	3.74	0.006	0.37
37	2023	3.80	3.00	6.80	108.70	0.00	205.70	202.70	0.017	3.29	0.005	0.04
38	2024	0.90	3.00	3.90	108.70	0.00	211.70	208.70	0.015	2.84	0.005	0.01
39	2025	0.00	3.00	3.00	108.70	0.00	217.70	214.70	0.013	2.39	0.004	0.00
40	2026	0.00	3.00	3.00	108.70	0.00	223.70	220.70	0.012	1.94	0.004	0.00
41	2027	0.00	3.00	3.00	108.70	0.00	229.70	226.70	0.011	1.49	0.003	0.00
42	2028	0.00	3.00	3.00	108.70	0.00	235.70	232.70	0.010	1.04	0.003	0.00
43	2029	0.00	3.00	3.00	108.70	0.00	241.70	238.70	0.009	0.59	0.002	0.00
44	2030	0.00	3.00	3.00	108.70	0.00	247.70	244.70	0.008	0.14	0.002	0.00
45	2031	0.00	3.00	3.00	108.70	0.00	253.70	250.70	0.007	0.00	0.002	0.00
46	2032	0.00	3.00	3.00	108.70	0.00	259.70	256.70	0.006	0.00	0.002	0.00
47	2033	0.00	3.00	3.00	108.70	0.00	265.70	262.70	0.005	0.00	0.001	0.00
48	2034	0.00	3.00	3.00	108.70	0.00	271.70	268.70	0.005	0.00	0.001	0.00
49	2035	0.00	3.00	3.00	108.70	0.00	277.70	274.70	0.004	0.00	0.001	0.00
50	2036	0.00	3.00	3.00	108.70	0.00	283.70	280.70	0.004	0.00	0.001	0.00
51	2037	0.00	3.00	3.00	108.70	0.00	289.70	286.70	0.003	0.00	0.001	0.00
52	2038	0.00	3.00	3.00	108.70	0.00	295.70	292.70	0.003	0.00	0.001	0.00
53	2039	0.00	3.00	3.00	108.70	0.00	301.70	298.70	0.003	0.00	0.001	0.00
54	2040	0.00	3.00	3.00	108.70	0.00	307.70	304.70	0.002	0.00	0.000	0.00
55	2041	0.00	3.00	3.00	108.70	0.00	313.70	310.70	0.002	0.00	0.000	0.00
56	2042	0.00	3.00	3.00	108.70	0.00	319.70	316.70	0.002	0.00	0.000	0.00
57	2043	0.00	3.00	3.00	108.70	0.00	325.70	322.70	0.002	0.00	0.000	0.00
TOTAL		331.00	145.00	476.00	4571.20	54.10	647.40	5272.70	4796.70	92.66		-0.00

Total construction cost = US\$280.9 mil.
 Replacement cost = US\$50.1 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 274
 Present value (C) = 181
 B/C = 1.5
 B-C = 93
 IRR = 15.5%

Table 13-6 Economic Internal Rate of Return
(Stage-1&2, 402 MW)

		MILLION US\$											
NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (19.53%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.837	-16.40
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.700	-14.42
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.586	-13.29
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.490	-23.51
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	-65.20	0.567	-37.00	0.410	-26.72
7	1993	60.00	0.00	60.00	0.00	0.00	0.00	0.00	-60.00	0.507	-30.40	0.343	-20.57
8	1994	34.20	1.90	36.10	11.30	4.90	3.50	19.70	-16.40	0.452	-7.42	0.287	-4.70
9	1995	12.10	1.90	14.00	16.10	4.50	5.90	26.50	12.50	0.404	5.05	0.240	3.00
10	1996	20.00	1.90	21.90	21.00	4.10	7.10	32.20	10.30	0.361	3.71	0.201	2.07
11	1997	49.90	1.90	51.80	26.20	3.70	8.40	38.30	-13.50	0.322	-4.35	0.168	-2.27
12	1998	29.70	1.90	31.60	31.50	3.30	9.70	44.50	12.90	0.287	3.71	0.141	1.81
13	1999	5.20	5.70	10.90	37.00	113.90	11.10	162.00	151.10	0.257	38.78	0.118	17.76
14	2000	0.00	5.70	5.70	42.80	109.40	12.60	164.80	159.10	0.229	36.46	0.098	15.65
15	2001	0.00	5.70	5.70	48.90	104.90	13.70	167.50	161.80	0.205	33.11	0.082	13.31
16	2002	0.00	5.70	5.70	55.20	100.10	14.20	169.50	163.80	0.183	29.93	0.069	11.27
17	2003	0.00	5.70	5.70	61.70	95.10	15.80	172.60	166.90	0.163	27.23	0.058	9.61
18	2004	0.00	5.70	5.70	68.60	89.80	17.50	175.90	170.20	0.146	24.79	0.048	8.20
19	2005	0.00	5.70	5.70	75.70	84.50	19.30	179.50	173.80	0.130	22.60	0.040	7.00
20	2006	0.00	5.70	5.70	83.00	78.80	21.20	183.00	177.30	0.116	20.59	0.034	5.98
21	2007	0.00	5.70	5.70	90.70	73.00	23.10	186.80	181.10	0.104	18.77	0.028	5.11
22	2008	0.00	5.70	5.70	98.70	66.90	24.10	189.70	184.00	0.093	17.03	0.024	4.34
23	2009	0.00	5.70	5.70	107.00	60.50	24.10	191.60	185.90	0.083	15.36	0.020	3.67
24	2010	0.00	5.70	5.70	108.70	53.90	24.10	186.70	181.00	0.074	13.36	0.017	2.99
25	2011	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.066	11.85	0.014	2.48
26	2012	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.059	10.58	0.012	2.08
27	2013	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.053	9.44	0.010	1.74
28	2014	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.047	8.43	0.008	1.45
29	2015	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.042	7.53	0.007	1.22
30	2016	4.00	5.70	9.70	108.70	52.70	24.10	185.50	175.80	0.037	6.57	0.006	1.00
31	2017	13.80	5.70	19.50	108.70	52.70	24.10	185.50	166.00	0.033	5.54	0.005	0.79
32	2018	13.10	5.70	18.80	108.70	52.70	24.10	185.50	168.70	0.030	4.97	0.004	0.66
33	2019	9.20	5.70	14.90	108.70	52.70	24.10	185.50	170.60	0.027	4.54	0.003	0.57
34	2020	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.024	4.27	0.003	0.50
35	2021	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.021	3.81	0.002	0.42
36	2022	23.70	5.70	29.40	108.70	52.70	24.10	185.50	156.10	0.019	2.96	0.002	0.30
37	2023	19.20	5.70	24.90	108.70	52.70	24.10	185.50	160.60	0.017	2.72	0.002	0.26
38	2024	4.00	5.70	9.70	108.70	52.70	24.10	185.50	175.80	0.015	2.65	0.001	0.24
39	2025	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.013	2.42	0.001	0.20
40	2026	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.012	2.16	0.001	0.17
41	2027	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.011	1.93	0.001	0.14
42	2028	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.010	1.73	0.001	0.12
43	2029	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.009	1.54	0.001	0.10
44	2030	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.008	1.38	0.000	0.08
45	2031	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.007	1.23	0.000	0.07
46	2032	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.006	1.10	0.000	0.06
47	2033	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.005	0.98	0.000	0.05
48	2034	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.005	0.87	0.000	0.04
49	2035	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.004	0.78	0.000	0.03
50	2036	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.004	0.70	0.000	0.03
51	2037	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.003	0.62	0.000	0.02
52	2038	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.003	0.56	0.000	0.02
53	2039	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.003	0.50	0.000	0.02
54	2040	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.002	0.44	0.000	0.01
55	2041	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.002	0.40	0.000	0.01
56	2042	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.002	0.35	0.000	0.01
57	2043	0.00	5.70	5.70	108.70	52.70	24.10	185.50	179.80	0.002	0.32	0.000	0.01
TOTAL		479.00	266.00	745.00	4571.20	2790.40	1050.70	8412.30	7667.30		251.78		0.00

Total construction cost = US\$392.0 mil.
 Replacement cost = US\$87.0 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 477
 Present value (C) = 225
 B/C = 2.1
 B-C = 252
 IRR = 19.5%

Table 13-7 Sensitivity Analysis of EIRR
(201 MW: Cost +10%)

MILLION US\$												
NO. YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (14.66%)	NET PRESENT VALUE
	INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						
1 1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	-5.30	1.000	-5.30	1.000	-5.30
2 1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	-21.60	0.893	-19.29	0.872	-18.84
3 1989	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.797	-18.10	0.761	-17.27
4 1990	25.00	0.00	25.00	0.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.663	-16.58
5 1991	52.80	0.00	52.80	0.00	0.00	0.00	0.00	-52.80	0.636	-33.56	0.579	-30.55
6 1992	71.70	0.00	71.70	0.00	0.00	0.00	0.00	-71.70	0.567	-40.68	0.505	-36.18
7 1993	66.00	0.00	66.00	0.00	0.00	0.00	0.00	-66.00	0.507	-33.44	0.440	-29.04
8 1994	30.60	2.20	32.80	11.30	4.90	3.50	19.70	-13.10	0.452	-5.93	0.384	-5.03
9 1995	0.00	2.20	2.20	16.10	4.50	5.90	26.50	24.30	0.404	9.81	0.335	8.13
10 1996	0.00	2.20	2.20	21.00	4.10	7.10	32.20	30.00	0.361	10.82	0.292	8.76
11 1997	6.10	2.20	8.30	26.20	3.70	8.40	38.30	30.00	0.322	9.66	0.255	7.64
12 1998	6.10	2.20	8.30	31.50	3.30	9.70	44.50	36.20	0.287	10.41	0.222	8.04
13 1999	1.80	3.30	5.10	37.00	5.70	11.10	53.80	48.70	0.257	12.50	0.194	9.43
14 2000	0.00	3.30	3.30	42.80	5.20	12.60	60.60	57.30	0.229	13.13	0.169	9.68
15 2001	0.00	3.30	3.30	48.90	4.70	13.70	67.30	64.00	0.205	13.10	0.147	9.43
16 2002	0.00	3.30	3.30	55.20	4.20	13.70	73.10	69.80	0.183	12.75	0.128	8.97
17 2003	0.00	3.30	3.30	61.70	3.70	13.70	79.10	75.80	0.163	12.36	0.112	8.49
18 2004	0.00	3.30	3.30	68.60	3.20	13.70	85.50	82.20	0.146	11.97	0.098	8.03
19 2005	0.00	3.30	3.30	75.70	2.60	13.70	92.00	88.70	0.130	11.53	0.086	7.56
20 2006	0.00	3.30	3.30	83.00	2.00	13.70	98.70	95.40	0.116	11.08	0.074	7.09
21 2007	0.00	3.30	3.30	90.70	1.40	13.70	105.80	102.50	0.104	10.63	0.065	6.64
22 2008	0.00	3.30	3.30	98.70	0.80	13.70	113.20	109.90	0.093	10.17	0.057	6.21
23 2009	0.00	3.30	3.30	107.00	0.10	13.70	120.80	117.50	0.083	9.71	0.049	5.79
24 2010	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.074	8.79	0.043	5.12
25 2011	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.066	7.85	0.037	4.47
26 2012	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.059	7.01	0.033	3.89
27 2013	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.053	6.26	0.029	3.40
28 2014	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.047	5.59	0.025	2.96
29 2015	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.042	4.99	0.022	2.58
30 2016	4.50	3.30	7.80	108.70	0.00	13.70	122.40	114.60	0.037	4.28	0.019	2.17
31 2017	15.30	3.30	18.60	108.70	0.00	13.70	122.40	103.80	0.033	3.46	0.016	1.71
32 2018	14.70	3.30	18.00	108.70	0.00	13.70	122.40	104.40	0.030	3.11	0.014	1.50
33 2019	10.20	3.30	13.50	103.70	0.00	13.70	122.40	108.90	0.027	2.90	0.013	1.37
34 2020	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.024	2.83	0.011	1.30
35 2021	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.021	2.33	0.010	1.14
36 2022	5.20	3.30	8.50	108.70	0.00	13.70	122.40	113.90	0.019	2.16	0.008	0.95
37 2023	4.20	3.30	7.50	108.70	0.00	13.70	122.40	114.90	0.017	1.94	0.007	0.83
38 2024	1.00	3.30	4.30	108.70	0.00	13.70	122.40	118.10	0.015	1.78	0.006	0.75
39 2025	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.013	1.61	0.006	0.66
40 2026	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.012	1.43	0.005	0.57
41 2027	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.011	1.28	0.004	0.50
42 2028	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.010	1.14	0.004	0.44
43 2029	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.009	1.02	0.003	0.38
44 2030	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.008	0.91	0.003	0.33
45 2031	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.007	0.81	0.002	0.29
46 2032	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.006	0.73	0.002	0.25
47 2033	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.005	0.65	0.002	0.22
48 2034	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.005	0.58	0.002	0.19
49 2035	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.004	0.52	0.001	0.17
50 2036	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.004	0.46	0.001	0.15
51 2037	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.003	0.41	0.001	0.13
52 2038	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.003	0.37	0.001	0.11
53 2039	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.003	0.33	0.001	0.10
54 2040	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.002	0.29	0.001	0.08
55 2041	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.002	0.26	0.001	0.07
56 2042	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.002	0.23	0.001	0.06
57 2043	0.00	3.30	3.30	108.70	0.00	13.70	122.40	119.10	0.002	0.21	0.000	0.06
TOTAL	364.80	159.50	524.30	4571.20	54.10	647.40	5272.70	4748.40		74.26		-0.00

Total construction cost = US\$309.7 mil.
 Replacement cost = US\$55.1 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 274
 Present value (C) = 200
 B/C = 1.37
 B-C = 74
 IRR = 14.7%

Table 13--8 Sensitivity Analysis of EIRR

(201 MW: Benefit -10%)

MILLION US\$													
NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (14.48%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.874	-17.12
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.763	-15.72
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.667	-15.13
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.582	-27.95
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	-65.20	0.567	-37.00	0.509	-33.16
7	1993	60.00	0.00	60.00	0.00	0.00	0.00	0.00	-60.00	0.507	-30.40	0.444	-26.66
8	1994	27.80	2.00	29.80	10.20	4.40	3.20	17.80	-12.00	0.452	-5.43	0.388	-4.66
9	1995	0.00	2.00	2.00	14.50	4.10	4.20	22.80	20.80	0.404	8.40	0.339	7.05
10	1996	0.00	2.00	2.00	18.90	3.70	5.30	27.90	25.90	0.361	9.34	0.296	7.67
11	1997	5.50	2.00	7.50	23.60	3.20	6.40	33.30	25.80	0.322	8.31	0.259	6.67
12	1998	5.10	2.00	7.10	28.40	3.00	7.60	39.00	31.90	0.287	9.17	0.226	7.21
13	1999	1.60	3.00	4.60	33.30	5.10	8.70	47.10	42.50	0.257	10.91	0.197	8.39
14	2000	0.00	3.00	3.00	38.50	4.70	10.80	53.20	50.20	0.229	11.50	0.172	8.66
15	2001	0.00	3.00	3.00	44.00	4.30	11.30	59.60	56.60	0.206	11.38	0.151	8.53
16	2002	0.00	3.00	3.00	49.70	3.80	12.30	65.80	62.80	0.183	11.47	0.132	8.26
17	2003	0.00	3.00	3.00	55.50	3.30	12.30	71.10	68.10	0.163	11.11	0.115	7.82
18	2004	0.00	3.00	3.00	61.70	2.80	12.30	76.80	73.80	0.146	10.75	0.100	7.41
19	2005	0.00	3.00	3.00	68.10	2.30	12.30	82.70	79.70	0.130	10.36	0.088	6.99
20	2006	0.00	3.00	3.00	74.70	1.80	12.30	88.80	85.80	0.116	9.96	0.077	6.57
21	2007	0.00	3.00	3.00	81.60	1.30	12.30	95.20	92.20	0.104	9.56	0.067	6.17
22	2008	0.00	3.00	3.00	88.80	0.70	12.30	101.80	98.80	0.093	9.14	0.058	5.78
23	2009	0.00	3.00	3.00	96.30	0.10	12.30	108.70	105.70	0.083	8.74	0.051	5.40
24	2010	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.074	7.89	0.045	4.77
25	2011	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.066	7.04	0.039	4.17
26	2012	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.059	6.29	0.034	3.64
27	2013	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.053	5.61	0.030	3.18
28	2014	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.047	5.01	0.026	2.78
29	2015	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.042	4.48	0.023	2.43
30	2016	4.10	3.00	7.10	97.60	0.00	12.30	109.90	102.80	0.037	3.84	0.020	2.04
31	2017	13.90	3.00	16.90	97.60	0.00	12.30	109.90	93.00	0.033	3.10	0.017	1.61
32	2018	13.40	3.00	16.40	97.60	0.00	12.30	109.90	93.50	0.030	2.79	0.015	1.41
33	2019	9.30	3.00	12.30	97.60	0.00	12.30	109.90	97.60	0.027	2.60	0.013	1.29
34	2020	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.024	2.54	0.012	1.23
35	2021	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.021	2.27	0.010	1.08
36	2022	4.70	3.00	7.70	97.60	0.00	12.30	109.90	102.20	0.019	1.94	0.009	0.90
37	2023	3.80	3.00	6.80	97.60	0.00	12.30	109.90	103.10	0.017	1.74	0.008	0.79
38	2024	0.90	3.00	3.90	97.60	0.00	12.30	109.90	105.00	0.015	1.60	0.007	0.71
39	2025	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.013	1.44	0.006	0.63
40	2026	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.012	1.29	0.005	0.55
41	2027	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.011	1.15	0.004	0.48
42	2028	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.010	1.03	0.004	0.42
43	2029	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.009	0.92	0.003	0.37
44	2030	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.008	0.82	0.003	0.32
45	2031	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.007	0.73	0.003	0.28
46	2032	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.006	0.65	0.002	0.24
47	2033	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.005	0.58	0.002	0.21
48	2034	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.005	0.52	0.002	0.19
49	2035	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.004	0.46	0.002	0.16
50	2036	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.004	0.41	0.001	0.14
51	2037	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.003	0.37	0.001	0.12
52	2038	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.003	0.33	0.001	0.11
53	2039	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.003	0.29	0.001	0.09
54	2040	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.002	0.26	0.001	0.08
55	2041	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.002	0.24	0.001	0.07
56	2042	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.002	0.21	0.001	0.06
57	2043	0.00	3.00	3.00	97.60	0.00	12.30	109.90	106.90	0.002	0.19	0.001	0.06
TOTAL		331.00	145.00	476.00	4106.20	48.70	573.30	4728.20	4252.20		62.73		-0.00

Total construction cost = US\$280.9 mil.
 Replacement cost = US\$50.1 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 244
 Present value (C) = 181
 B/C = 1.3
 B-C = 63
 IRR = 14.5%

Table 13-9 Sensitivity Analysis of EIRR

(201 MW: Cost +10%, Benefit -10%)

(UNIT: MILLION US\$)

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (13.64%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY					
1	1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	0.893	-19.29	0.880	-19.01
3	1989	22.70	0.00	22.70	0.00	0.00	0.00	0.00	0.797	-18.10	0.774	-17.58
4	1990	23.00	0.00	23.00	0.00	0.00	0.00	0.00	0.712	-17.79	0.681	-17.04
5	1991	52.80	0.00	52.80	0.00	0.00	0.00	0.00	0.636	-33.56	0.600	-31.66
6	1992	71.70	0.00	71.70	0.00	0.00	0.00	0.00	0.567	-40.68	0.528	-37.83
7	1993	66.00	0.00	66.00	0.00	0.00	0.00	0.00	0.507	-33.44	0.464	-30.65
8	1994	30.60	2.20	32.80	10.20	4.40	3.20	17.80	0.452	-6.79	0.409	-6.13
9	1996	0.00	2.20	2.20	14.50	4.10	4.30	22.80	0.404	8.32	0.350	7.11
10	1996	0.00	2.20	2.20	18.90	3.70	5.30	27.90	0.351	9.27	0.316	8.13
11	1997	6.10	2.20	8.30	23.50	3.30	6.40	33.20	0.322	8.02	0.278	6.93
12	1998	6.10	2.20	8.30	28.40	3.00	7.50	38.90	0.287	8.80	0.245	7.50
13	1999	1.80	3.30	5.10	33.30	5.10	8.70	47.10	0.257	10.78	0.216	9.06
14	2000	0.00	3.30	3.30	38.60	4.70	10.00	53.30	0.229	11.46	0.190	9.49
15	2001	0.00	3.30	3.30	44.00	4.30	11.30	59.60	0.205	11.52	0.167	9.40
16	2002	0.00	3.30	3.30	49.70	3.80	12.30	65.80	0.183	11.42	0.147	9.18
17	2003	0.00	3.30	3.30	55.60	3.30	12.30	71.20	0.163	11.08	0.129	8.78
18	2004	0.00	3.30	3.30	61.70	2.80	12.30	76.80	0.146	10.70	0.114	8.36
19	2005	0.00	3.30	3.30	68.10	2.30	12.30	82.70	0.130	10.33	0.100	7.95
20	2006	0.00	3.30	3.30	74.70	1.80	12.30	88.80	0.116	9.93	0.088	7.53
21	2007	0.00	3.30	3.30	81.60	1.30	12.30	95.20	0.104	9.53	0.078	7.12
22	2008	0.00	3.30	3.30	88.80	0.70	12.30	101.80	0.093	9.12	0.068	6.72
23	2009	0.00	3.30	3.30	96.30	0.10	12.30	108.70	0.083	8.71	0.060	6.33
24	2010	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.074	7.87	0.053	5.83
25	2011	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.066	7.02	0.046	4.96
26	2012	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.059	6.27	0.041	4.36
27	2013	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.053	5.60	0.036	3.84
28	2014	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.047	5.00	0.032	3.38
29	2015	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.042	4.46	0.028	2.97
30	2016	4.50	3.30	7.80	97.60	0.00	12.30	109.90	0.037	3.82	0.025	2.50
31	2017	15.30	3.30	18.60	97.60	0.00	12.30	109.90	0.033	3.05	0.022	1.97
32	2018	14.70	3.30	18.00	97.60	0.00	12.30	109.90	0.030	2.74	0.019	1.75
33	2019	10.20	3.30	13.50	97.60	0.00	12.30	109.90	0.027	2.57	0.017	1.61
34	2020	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.024	2.53	0.015	1.57
35	2021	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.021	2.26	0.013	1.38
36	2022	5.20	3.30	8.50	97.60	0.00	12.30	109.90	0.019	1.92	0.011	1.15
37	2023	4.20	3.30	7.50	97.60	0.00	12.30	109.90	0.017	1.73	0.010	1.03
38	2024	1.00	3.30	4.30	97.60	0.00	12.30	109.90	0.015	1.59	0.009	0.93
39	2025	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.013	1.44	0.008	0.83
40	2026	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.012	1.28	0.007	0.73
41	2027	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.011	1.15	0.006	0.64
42	2028	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.010	1.02	0.005	0.56
43	2029	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.009	0.91	0.005	0.50
44	2030	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.008	0.82	0.004	0.44
45	2031	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.007	0.73	0.004	0.38
46	2032	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.006	0.65	0.003	0.34
47	2033	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.005	0.58	0.003	0.30
48	2034	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.005	0.52	0.002	0.26
49	2035	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.004	0.46	0.002	0.23
50	2036	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.004	0.41	0.002	0.20
51	2037	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.003	0.37	0.002	0.18
52	2038	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.003	0.33	0.001	0.16
53	2039	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.003	0.29	0.001	0.14
54	2040	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.002	0.26	0.001	0.12
55	2041	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.002	0.23	0.001	0.11
56	2042	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.002	0.21	0.001	0.09
57	2043	0.00	3.30	3.30	97.60	0.00	12.30	109.90	0.002	0.19	0.001	0.08
TOTAL		364.80	159.50	524.30	4106.30	48.70	573.20	4728.20	4203.90	44.31		-0.00

Total construction cost = US\$309.7 mil.
 Replacement cost = US\$55.1 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 244
 Present value (C) = 200
 B/C = 1.2
 B-C = 44
 IRR = 13.6%

Table 13-10 Sensitivity Analysis of EIRR

(201 MW: Power Export Decrease by 20 MW)

NO.	YEAR	INVESTMENT AND REPLACEMENT	COSTS OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	BENEFITS SALABLE EXPORT SURPLUS	USEFUL CAPACITY	TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (14.54%)	NET PRESENT VALUE
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.50	0.00	19.50	0.00	0.00	0.00	0.00	-19.50	0.893	-17.50	0.873	-17.11
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.752	-15.70
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.665	-15.11
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.80	0.581	-27.89
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	-65.20	0.567	-37.00	0.507	-33.07
7	1993	50.00	0.00	50.00	0.00	0.00	0.00	0.00	-50.00	0.507	-30.40	0.443	-26.57
8	1994	27.80	2.00	29.80	5.80	5.30	2.20	13.30	-16.50	0.452	-7.46	0.387	-6.38
9	1995	0.00	2.00	2.00	10.00	5.00	3.30	18.30	16.30	0.404	5.58	0.338	5.50
10	1996	0.00	2.00	2.00	15.50	4.60	4.50	24.60	22.60	0.361	8.15	0.295	6.65
11	1997	5.50	2.00	7.50	20.60	4.20	5.70	30.50	23.00	0.322	7.41	0.257	5.92
12	1998	5.10	2.00	7.10	26.00	3.70	7.00	36.70	29.60	0.287	8.51	0.225	6.65
13	1999	1.60	3.00	4.60	31.50	6.10	8.40	46.00	41.40	0.257	10.63	0.196	8.12
14	2000	0.00	3.00	3.00	37.30	5.60	9.80	52.70	49.70	0.229	11.39	0.171	8.51
15	2001	0.00	3.00	3.00	43.40	5.20	11.20	59.80	56.80	0.205	11.62	0.149	8.49
16	2002	0.00	3.00	3.00	49.70	4.70	12.80	67.20	64.20	0.183	11.73	0.130	8.38
17	2003	0.00	3.00	3.00	56.20	4.10	13.70	74.00	71.00	0.163	11.55	0.114	8.09
18	2004	0.00	3.00	3.00	63.10	3.60	13.70	80.40	77.40	0.146	11.27	0.099	7.70
19	2005	0.00	3.00	3.00	70.10	3.00	13.70	86.80	83.80	0.130	10.90	0.087	7.26
20	2006	0.00	3.00	3.00	77.50	2.50	13.70	93.70	90.70	0.116	10.53	0.076	6.88
21	2007	0.00	3.00	3.00	85.20	1.80	13.70	100.70	97.70	0.104	10.13	0.066	6.47
22	2008	0.00	3.00	3.00	93.20	1.20	13.70	108.10	105.10	0.093	9.73	0.058	6.07
23	2009	0.00	3.00	3.00	101.50	0.60	13.70	115.80	112.80	0.083	9.32	0.050	5.69
24	2010	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.074	8.80	0.044	5.25
25	2011	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.066	7.85	0.038	4.58
26	2012	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.059	7.01	0.034	4.00
27	2013	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.053	6.26	0.029	3.49
28	2014	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.047	5.59	0.026	3.05
29	2015	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.042	4.99	0.022	2.66
30	2016	4.10	3.00	7.10	108.50	0.00	13.70	122.20	115.10	0.037	4.30	0.020	2.24
31	2017	13.90	3.00	16.90	108.50	0.00	13.70	122.20	105.30	0.033	3.51	0.017	1.79
32	2018	13.40	3.00	16.40	108.50	0.00	13.70	122.20	105.80	0.030	3.15	0.015	1.57
33	2019	9.30	3.00	12.30	108.50	0.00	13.70	122.20	109.90	0.027	2.92	0.013	1.43
34	2020	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.024	2.83	0.011	1.35
35	2021	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.021	2.53	0.010	1.18
36	2022	4.70	3.00	7.70	108.50	0.00	13.70	122.20	114.50	0.019	2.17	0.009	0.99
37	2023	3.80	3.00	6.80	108.50	0.00	13.70	122.20	115.40	0.017	1.95	0.008	0.87
38	2024	0.00	3.00	3.00	108.50	0.00	13.70	122.20	118.30	0.015	1.79	0.007	0.78
39	2025	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.013	1.61	0.006	0.69
40	2026	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.012	1.43	0.005	0.60
41	2027	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.011	1.28	0.004	0.52
42	2028	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.010	1.14	0.004	0.46
43	2029	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.009	1.02	0.003	0.40
44	2030	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.008	0.91	0.003	0.35
45	2031	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.007	0.81	0.003	0.30
46	2032	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.006	0.73	0.002	0.26
47	2033	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.005	0.65	0.002	0.23
48	2034	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.005	0.58	0.002	0.20
49	2035	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.004	0.52	0.001	0.18
50	2036	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.004	0.46	0.001	0.15
51	2037	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.003	0.41	0.001	0.13
52	2038	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.003	0.37	0.001	0.12
53	2039	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.003	0.33	0.001	0.10
54	2040	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.002	0.29	0.001	0.09
55	2041	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.002	0.26	0.001	0.08
56	2042	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.002	0.23	0.001	0.07
57	2043	0.00	3.00	3.00	108.50	0.00	13.70	122.20	119.20	0.002	0.21	0.000	0.06
TOTAL		331.00	145.00	476.00	4475.60	61.20	626.60	5163.40	4687.40		58.15		-0.00

Total construction cost = US\$280.9 mil.
 Replacement cost = US\$50.1 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 249
 Present value (C) = 181
 B/C = 1.4
 B-C = 68
 IRR = 14.5%

Table 13-11 Sensitivity Analysis of EIRR

(402 MW: Cost +10%)

		MILLION US\$											
NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (18.46%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	-5.30	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	-21.60	0.893	-19.29	0.844	-18.23
3	1989	23.70	0.00	23.70	0.00	0.00	0.00	0.00	-23.70	0.797	-18.10	0.713	-18.18
4	1990	25.00	0.00	25.00	0.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.602	-15.04
5	1991	52.80	0.00	52.80	0.00	0.00	0.00	0.00	-52.80	0.636	-33.56	0.508	-26.81
6	1992	71.70	0.00	71.70	0.00	0.00	0.00	0.00	-71.70	0.567	-40.68	0.429	-30.73
7	1993	66.00	0.00	66.00	0.00	0.00	0.00	0.00	-66.00	0.507	-33.44	0.362	-23.88
8	1994	37.60	2.10	39.70	11.30	4.90	3.50	19.70	-20.00	0.452	-9.05	0.305	-6.11
9	1995	13.30	2.10	15.40	16.10	4.50	5.90	26.50	11.10	0.404	4.48	0.258	2.86
10	1996	22.00	2.10	24.10	21.00	4.10	7.10	32.20	8.10	0.361	2.92	0.218	1.76
11	1997	54.90	2.10	57.00	26.20	3.70	8.40	38.30	-18.70	0.322	-6.02	0.184	-3.44
12	1998	32.70	2.10	34.80	31.50	3.30	9.70	44.50	9.70	0.287	2.79	0.155	1.50
13	1999	5.70	6.30	12.00	37.00	113.90	11.10	162.00	150.00	0.257	38.50	0.131	19.64
14	2000	0.00	6.30	6.30	42.80	109.40	12.60	164.30	158.50	0.229	36.32	0.111	17.52
15	2001	0.00	6.30	6.30	48.90	104.90	13.70	167.50	161.20	0.205	32.98	0.093	15.04
16	2002	0.00	6.30	6.30	55.20	100.10	14.20	169.50	163.20	0.183	29.82	0.079	12.85
17	2003	0.00	6.30	6.30	61.70	95.10	15.80	172.60	166.30	0.163	27.13	0.066	11.05
18	2004	0.00	6.30	6.30	68.60	89.80	17.50	175.90	169.60	0.146	24.70	0.056	9.52
19	2005	0.00	6.30	6.30	75.70	84.50	19.30	179.50	173.20	0.130	22.52	0.047	8.20
20	2006	0.00	6.30	6.30	83.00	78.80	21.20	183.00	176.70	0.116	20.52	0.040	7.07
21	2007	0.00	6.30	6.30	90.70	73.00	23.10	186.80	180.50	0.104	18.71	0.034	6.09
22	2008	0.00	6.30	6.30	98.70	66.90	24.10	189.70	183.40	0.093	16.98	0.028	5.23
23	2009	0.00	6.30	6.30	107.00	60.50	24.10	191.60	185.30	0.083	15.31	0.024	4.46
24	2010	0.00	6.30	6.30	108.70	53.90	24.10	186.70	180.40	0.074	13.31	0.020	3.66
25	2011	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.066	11.81	0.017	3.07
26	2012	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.059	10.54	0.014	2.59
27	2013	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.053	9.41	0.012	2.19
28	2014	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.047	8.40	0.010	1.85
29	2015	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.042	7.50	0.009	1.56
30	2016	4.40	6.30	10.70	108.70	52.70	24.10	185.50	174.80	0.037	6.53	0.007	1.28
31	2017	15.20	6.30	21.50	108.70	52.70	24.10	185.50	164.00	0.033	5.47	0.006	1.02
32	2018	14.40	6.30	20.70	108.70	52.70	24.10	185.50	164.80	0.030	4.91	0.005	0.86
33	2019	10.10	6.30	16.40	108.70	52.70	24.10	185.50	169.10	0.027	4.50	0.004	0.75
34	2020	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.024	4.26	0.004	0.67
35	2021	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.021	3.80	0.003	0.66
36	2022	26.10	6.30	32.40	108.70	52.70	24.10	185.50	153.10	0.019	2.90	0.003	0.41
37	2023	21.10	6.30	27.40	108.70	52.70	24.10	185.50	158.10	0.017	2.67	0.002	0.35
38	2024	4.40	6.30	10.70	108.70	52.70	24.10	185.50	174.80	0.015	2.64	0.002	0.33
39	2025	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.013	2.42	0.002	0.29
40	2026	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.012	2.16	0.001	0.24
41	2027	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.011	1.93	0.001	0.20
42	2028	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.010	1.72	0.001	0.17
43	2029	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.009	1.54	0.001	0.15
44	2030	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.008	1.37	0.001	0.12
45	2031	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.007	1.22	0.001	0.10
46	2032	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.006	1.09	0.000	0.09
47	2033	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.005	0.98	0.000	0.07
48	2034	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.005	0.87	0.000	0.06
49	2035	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.004	0.78	0.000	0.05
50	2036	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.004	0.69	0.000	0.04
51	2037	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.003	0.62	0.000	0.04
52	2038	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.003	0.55	0.000	0.03
53	2039	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.003	0.49	0.000	0.03
54	2040	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.002	0.44	0.000	0.02
55	2041	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.002	0.39	0.000	0.02
56	2042	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.002	0.35	0.000	0.02
57	2043	0.00	6.30	6.30	108.70	52.70	24.10	185.50	179.20	0.002	0.31	0.000	0.01
TOTAL		527.00	294.00	821.00	4571.20	2790.40	1050.70	8412.30	7591.30		229.06		0.00

Total construction cost = US\$431.3 mil.
 Replacement cost = US\$95.7 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 477
 Present value (C) = 248
 B/C = 1.9
 B-C = 229
 IRR = 18.5%

Table 13-12. Sensitivity Analysis of EIRR

(402 MW: Benefit -10%)

		MILLION US\$											
NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (18.34%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT SURPLUS	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.845	-16.56
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.714	-14.71
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.603	-13.70
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.510	-24.47
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	-65.20	0.567	-37.00	0.431	-28.09
7	1993	60.00	0.00	60.00	0.00	0.00	0.00	0.00	-60.00	0.507	-30.40	0.364	-21.84
8	1994	34.20	1.90	36.10	10.20	4.40	3.20	17.80	-18.30	0.452	-8.28	0.308	-5.63
9	1995	12.10	1.90	14.00	14.50	4.10	4.20	22.80	8.80	0.404	3.55	0.260	2.29
10	1996	20.00	1.90	21.90	18.90	3.70	5.30	27.90	6.00	0.361	2.16	0.220	1.32
11	1997	49.90	1.90	51.80	23.60	3.30	6.40	33.30	-18.50	0.322	-5.96	0.186	-3.43
12	1998	29.70	1.90	31.60	28.40	3.00	7.60	39.00	7.40	0.287	2.13	0.157	1.16
13	1999	5.20	5.70	10.90	33.70	102.50	8.70	141.50	133.60	0.257	34.29	0.133	17.71
14	2000	0.00	5.70	5.70	38.50	98.50	10.00	147.00	141.30	0.229	32.38	0.112	15.82
15	2001	0.00	5.70	5.70	44.00	94.40	11.30	149.70	144.00	0.205	29.47	0.095	13.63
16	2002	0.00	5.70	5.70	49.70	90.10	12.80	152.60	146.90	0.183	26.84	0.080	11.75
17	2003	0.00	5.70	5.70	55.50	85.60	14.20	155.30	149.60	0.163	24.40	0.068	10.11
18	2004	0.00	5.70	5.70	61.70	80.80	15.80	158.30	152.60	0.146	22.23	0.057	8.71
19	2005	0.00	5.70	5.70	68.10	76.10	17.40	161.60	155.90	0.130	20.27	0.048	7.52
20	2006	0.00	5.70	5.70	74.70	70.90	19.10	164.70	159.00	0.116	18.46	0.041	6.48
21	2007	0.00	5.70	5.70	81.60	65.70	20.80	168.10	162.40	0.104	16.84	0.034	5.59
22	2008	0.00	5.70	5.70	88.80	60.20	21.70	170.70	165.00	0.093	15.27	0.029	4.80
23	2009	0.00	5.70	5.70	96.30	54.50	21.70	172.50	166.80	0.083	13.78	0.025	4.10
24	2010	0.00	5.70	5.70	104.10	48.50	21.70	174.30	168.60	0.074	12.44	0.021	3.50
25	2011	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.066	11.14	0.018	2.97
26	2012	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.059	9.95	0.015	2.51
27	2013	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.053	8.88	0.013	2.12
28	2014	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.047	7.93	0.011	1.79
29	2015	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.042	7.08	0.009	1.51
30	2016	4.00	5.70	9.70	105.70	47.40	21.70	174.80	165.10	0.037	6.17	0.008	1.25
31	2017	13.80	5.70	19.50	105.70	47.40	21.70	174.80	155.30	0.033	5.18	0.006	0.99
32	2018	13.10	5.70	18.80	105.70	47.40	21.70	174.80	156.00	0.030	4.65	0.005	0.84
33	2019	9.20	5.70	14.90	105.70	47.40	21.70	174.80	159.90	0.027	4.25	0.005	0.73
34	2020	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.024	4.02	0.004	0.65
35	2021	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.021	3.59	0.003	0.55
36	2022	23.70	5.70	29.40	105.70	47.40	21.70	174.80	145.40	0.019	2.75	0.003	0.40
37	2023	19.20	5.70	24.90	105.70	47.40	21.70	174.80	149.90	0.017	2.53	0.002	0.35
38	2024	4.00	5.70	9.70	105.70	47.40	21.70	174.80	165.10	0.015	2.49	0.002	0.32
39	2025	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.013	2.28	0.002	0.28
40	2026	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.012	2.04	0.001	0.24
41	2027	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.011	1.82	0.001	0.20
42	2028	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.010	1.62	0.001	0.17
43	2029	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.009	1.45	0.001	0.14
44	2030	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.008	1.29	0.001	0.12
45	2031	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.007	1.15	0.001	0.10
46	2032	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.006	1.03	0.001	0.09
47	2033	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.005	0.92	0.000	0.07
48	2034	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.005	0.82	0.000	0.06
49	2035	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.004	0.73	0.000	0.05
50	2036	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.004	0.66	0.000	0.04
51	2037	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.003	0.59	0.000	0.04
52	2038	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.003	0.52	0.000	0.03
53	2039	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.003	0.47	0.000	0.03
54	2040	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.002	0.42	0.000	0.02
55	2041	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.002	0.37	0.000	0.02
56	2042	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.002	0.33	0.000	0.02
57	2043	0.00	5.70	5.70	105.70	47.40	21.70	174.80	169.10	0.002	0.30	0.000	0.01
TOTAL		479.00	266.00	745.00	4380.00	2510.50	938.00	7828.50	7083.50		206.94		-0.00

Total construction cost = US\$392.0 mil.
 Replacement cost = US\$87.0 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 432
 Present value (C) = 225
 B/C = 1.9
 B-C = 207
 IRR = 18.3%

Table 13-13 Sensitivity Analysis of EIRR

(402 MW: Cost +10%, Benefit -10%)

(UNIT: MILLION US\$)

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (17.32%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT SURPLUS	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	-5.30	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	-21.60	0.893	-19.29	0.852	-18.41
3	1989	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.797	-18.10	0.727	-16.49
4	1990	25.00	0.00	25.00	0.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.619	-15.48
5	1991	32.80	0.00	32.80	0.00	0.00	0.00	0.00	-32.80	0.636	-33.56	0.528	-27.87
6	1992	71.70	0.00	71.70	0.00	0.00	0.00	0.00	-71.70	0.567	-40.68	0.450	-32.26
7	1993	66.00	0.00	66.00	0.00	0.00	0.00	0.00	-66.00	0.507	-33.44	0.383	-25.31
8	1994	37.60	2.10	39.70	10.20	4.40	3.20	17.80	-21.90	0.452	-9.91	0.327	-7.16
9	1995	13.30	2.10	15.40	14.50	4.10	4.20	22.80	7.40	0.404	2.99	0.279	2.06
10	1996	22.00	2.10	24.10	18.90	3.70	5.30	27.90	3.80	0.361	1.37	0.237	0.90
11	1997	54.90	2.10	57.00	23.60	3.30	6.40	33.30	-23.70	0.322	-7.63	0.202	-4.80
12	1998	32.70	2.10	34.80	28.40	3.00	7.60	39.00	4.20	0.287	1.21	0.173	0.72
13	1999	5.70	6.30	12.00	33.30	102.50	8.70	144.50	132.50	0.257	34.01	0.147	19.49
14	2000	0.00	6.30	6.30	38.50	98.50	10.00	147.00	140.70	0.229	32.24	0.125	17.64
15	2001	0.00	6.30	6.30	44.00	94.40	11.30	149.70	143.40	0.205	29.34	0.107	15.32
16	2002	0.00	6.30	6.30	49.70	90.10	12.80	152.60	146.30	0.183	26.73	0.091	13.32
17	2003	0.00	6.30	6.30	55.50	85.60	14.20	155.30	149.00	0.163	24.31	0.078	11.57
18	2004	0.00	6.30	6.30	61.70	80.80	15.80	158.30	152.00	0.146	22.14	0.066	10.06
19	2005	0.00	6.30	6.30	68.10	76.10	17.40	161.60	155.30	0.130	20.20	0.056	8.76
20	2006	0.00	6.30	6.30	74.70	70.90	19.10	164.70	158.40	0.116	18.39	0.048	7.61
21	2007	0.00	6.30	6.30	81.60	65.70	20.80	168.10	161.80	0.104	16.77	0.041	6.63
22	2008	0.00	6.30	6.30	88.80	60.20	21.70	170.70	164.40	0.093	15.22	0.035	5.74
23	2009	0.00	6.30	6.30	96.30	54.50	21.70	172.50	166.20	0.083	13.74	0.030	4.95
24	2010	0.00	6.30	6.30	104.10	48.50	21.70	174.30	169.00	0.074	12.40	0.025	4.26
25	2011	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.066	11.10	0.022	3.64
26	2012	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.059	9.91	0.018	3.11
27	2013	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.053	8.85	0.016	2.65
28	2014	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.047	7.90	0.013	2.26
29	2015	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.042	7.05	0.011	1.92
30	2016	4.40	6.30	10.70	105.70	47.40	21.70	174.80	164.10	0.037	6.13	0.010	1.60
31	2017	15.20	6.30	21.50	105.70	47.40	21.70	174.80	153.30	0.033	5.12	0.008	1.27
32	2018	14.40	6.30	20.70	105.70	47.40	21.70	174.80	154.10	0.030	4.59	0.007	1.09
33	2019	10.10	6.30	16.40	105.70	47.40	21.70	174.80	158.40	0.027	4.21	0.006	0.95
34	2020	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.024	4.00	0.005	0.87
35	2021	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.021	3.57	0.004	0.74
36	2022	26.10	6.30	32.40	105.70	47.40	21.70	174.80	142.40	0.019	2.70	0.004	0.53
37	2023	21.10	6.30	27.40	105.70	47.40	21.70	174.80	147.40	0.017	2.49	0.003	0.47
38	2024	4.40	6.30	10.70	105.70	47.40	21.70	174.80	164.10	0.015	2.48	0.003	0.44
39	2025	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.013	2.27	0.002	0.39
40	2026	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.012	2.03	0.002	0.33
41	2027	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.011	1.81	0.002	0.28
42	2028	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.010	1.62	0.001	0.24
43	2029	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.009	1.44	0.001	0.21
44	2030	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.008	1.29	0.001	0.18
45	2031	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.007	1.15	0.001	0.15
46	2032	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.006	1.03	0.001	0.13
47	2033	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.005	0.92	0.001	0.11
48	2034	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.005	0.82	0.001	0.09
49	2035	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.004	0.73	0.000	0.08
50	2036	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.004	0.65	0.000	0.07
51	2037	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.003	0.58	0.000	0.06
52	2038	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.003	0.52	0.000	0.05
53	2039	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.003	0.46	0.000	0.04
54	2040	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.002	0.41	0.000	0.04
55	2041	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.002	0.37	0.000	0.03
56	2042	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.002	0.33	0.000	0.03
57	2043	0.00	6.30	6.30	105.70	47.40	21.70	174.80	168.50	0.002	0.30	0.000	0.02
TOTAL		527.00	294.00	821.00	4380.00	2510.50	938.00	7828.50	7007.50		184.21		0.00

Total construction cost = US\$431.1 mil.
 Replacement cost = US\$95.7 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 432
 Present value (C) = 248
 B/C = 1.7
 B-C = 184
 IRR = 17.3%

Table 13-14 Sensitivity Analysis of EIRR

(402 MW: Power Export Decrease by 20 MW)

NO.	YEAR	INVESTMENT AND REPLACEMENT	COSTS OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	BENEFITS SALABLE EXPORT, SURPLUS	USEFUL CAPACITY	TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (18.81%)	NET PRESENT VALUE
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.842	-16.50
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.708	-14.59
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.596	-13.54
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.502	-24.09
6	1992	65.20	0.00	65.20	0.00	0.00	0.00	0.00	-65.20	0.567	-37.00	0.422	-27.54
7	1993	60.00	0.00	60.00	0.00	0.00	0.00	0.00	-60.00	0.507	-30.40	0.356	-21.33
8	1994	34.20	1.90	36.10	5.80	5.30	2.20	13.20	-22.80	0.452	-10.31	0.299	-6.82
9	1995	12.10	1.90	14.00	10.00	5.00	3.30	18.30	4.30	0.404	1.74	0.252	1.08
10	1996	20.00	1.90	21.90	15.30	4.60	4.50	24.60	2.70	0.361	0.97	0.212	0.57
11	1997	49.90	1.90	51.80	20.60	4.20	5.70	30.50	-21.30	0.322	-6.86	0.178	-3.80
12	1998	29.70	1.90	31.60	26.00	3.70	7.00	36.70	5.10	0.287	1.47	0.150	0.77
13	1999	5.20	5.70	10.90	31.50	118.10	8.40	158.00	147.10	0.257	37.76	0.126	18.59
14	2000	0.00	5.70	5.70	37.30	113.70	9.80	160.80	155.10	0.229	35.54	0.106	16.50
15	2001	0.00	5.70	5.70	45.40	109.10	11.20	163.70	158.00	0.205	32.33	0.090	14.15
16	2002	0.00	5.70	5.70	49.70	104.30	12.80	166.80	161.10	0.183	29.43	0.075	12.14
17	2003	0.00	5.70	5.70	56.20	99.30	14.40	169.90	164.20	0.163	26.78	0.063	10.42
18	2004	0.00	5.70	5.70	63.10	88.70	16.20	168.00	162.30	0.146	23.64	0.053	8.67
19	2005	0.00	5.70	5.70	70.10	83.00	17.90	171.00	165.30	0.130	21.50	0.045	7.43
20	2006	0.00	5.70	5.70	77.50	77.20	19.80	174.50	168.80	0.116	19.60	0.038	6.39
21	2007	0.00	5.70	5.70	85.20	71.10	21.80	178.10	172.40	0.104	17.87	0.032	5.49
22	2008	0.00	5.70	5.70	93.20	64.70	23.80	181.70	176.00	0.093	16.29	0.027	4.72
23	2009	0.00	5.70	5.70	101.50	58.10	24.10	183.70	178.00	0.083	14.71	0.023	4.01
24	2010	0.00	5.70	5.70	110.20	52.70	24.10	187.00	181.30	0.074	13.38	0.019	3.44
25	2011	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.066	12.42	0.016	3.01
26	2012	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.059	11.09	0.013	2.54
27	2013	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.053	9.90	0.011	2.13
28	2014	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.047	8.84	0.010	1.80
29	2015	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.042	7.89	0.008	1.51
30	2016	4.00	5.70	9.70	117.40	52.70	24.10	194.20	184.50	0.037	6.90	0.007	1.25
31	2017	13.80	5.70	19.50	117.40	52.70	24.10	194.20	174.70	0.033	5.83	0.006	0.99
32	2018	13.10	5.70	18.80	117.40	52.70	24.10	194.20	175.40	0.030	5.23	0.005	0.84
33	2019	9.20	5.70	14.90	117.40	52.70	24.10	194.20	179.30	0.027	4.77	0.004	0.72
34	2020	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.024	4.48	0.003	0.64
35	2021	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.021	4.00	0.003	0.54
36	2022	23.70	5.70	29.40	117.40	52.70	24.10	194.20	164.80	0.019	3.12	0.002	0.40
37	2023	19.20	5.70	24.90	117.40	52.70	24.10	194.20	169.30	0.017	2.86	0.002	0.34
38	2024	4.00	5.70	9.70	117.40	52.70	24.10	194.20	184.30	0.015	2.79	0.002	0.31
39	2025	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.013	2.54	0.001	0.27
40	2026	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.012	2.27	0.001	0.23
41	2027	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.011	2.03	0.001	0.19
42	2028	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.010	1.81	0.001	0.16
43	2029	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.009	1.61	0.001	0.14
44	2030	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.008	1.44	0.001	0.11
45	2031	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.007	1.29	0.001	0.10
46	2032	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.006	1.15	0.000	0.08
47	2033	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.005	1.03	0.000	0.07
48	2034	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.005	0.92	0.000	0.06
49	2035	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.004	0.82	0.000	0.05
50	2036	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.004	0.73	0.000	0.04
51	2037	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.003	0.65	0.000	0.03
52	2038	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.003	0.58	0.000	0.03
53	2039	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.003	0.52	0.000	0.02
54	2040	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.002	0.46	0.000	0.02
55	2041	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.002	0.41	0.000	0.02
56	2042	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.002	0.37	0.000	0.01
57	2043	0.00	5.70	5.70	117.40	52.70	24.10	194.20	188.50	0.002	0.33	0.000	0.01
TOTAL		479.00	266.00	745.00	4771.00	2801.90	1022.30	8595.20	7850.20		234.13		0.01

Total construction cost = US\$392.0 mil.
 Replacement cost = US\$87.0 million
 kw value B1 = 68 US\$/kw
 kwh value B2 = 0.063 US\$/kwh
 kwh value B3 = 0.048 US\$/kwh
 kwh value B4 = 0.005 US\$/kwh

Discount rate = 12%
 Present value (B) = 460
 Present value (C) = 225
 B/C = 2.0
 B-C = 235
 IRR = 18.8%

Table 13--15 Financial Internal Rate of Return
(Stage--1, 201 MW)

MILLION US\$													
NO. YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (10.80%)	NET PRESENT VALUE	
	INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY							
1 1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80	
2 1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.903	-17.69	
3 1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.815	-16.78	
4 1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-15.15	0.735	-15.59	
5 1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.664	-31.85	
6 1992	74.60	0.00	74.60	0.00	0.00	0.00	0.00	-74.60	0.567	-42.33	0.599	-44.68	
7 1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.541	-62.71	
8 1994	55.90	2.70	58.60	10.40	0.00	0.00	10.40	-48.20	0.452	-21.80	0.488	-23.52	
9 1995	0.00	2.70	2.70	14.90	0.00	0.00	14.90	12.20	0.404	4.93	0.440	5.37	
10 1996	0.00	2.70	2.70	19.30	0.00	0.00	19.30	16.60	0.361	5.99	0.397	6.60	
11 1997	5.50	2.70	8.20	24.10	0.00	0.00	24.10	15.90	0.322	5.12	0.359	5.70	
12 1998	11.20	2.70	13.90	29.00	0.00	0.00	29.00	15.10	0.287	4.34	0.324	4.89	
13 1999	5.50	4.10	9.70	34.20	0.00	0.00	34.20	24.50	0.257	6.29	0.292	7.16	
14 2000	0.00	4.10	4.10	39.50	0.00	0.00	39.50	35.40	0.229	8.11	0.264	9.34	
15 2001	0.00	4.10	4.10	45.10	0.00	0.00	45.10	41.00	0.205	8.99	0.238	9.76	
16 2002	0.00	4.10	4.10	50.90	0.00	0.00	50.90	46.80	0.183	8.55	0.215	10.06	
17 2003	0.00	4.10	4.10	56.90	0.00	0.00	56.90	52.80	0.163	8.61	0.194	10.24	
18 2004	0.00	4.10	4.10	63.30	0.00	0.00	63.30	59.20	0.146	8.62	0.175	10.36	
19 2005	0.00	4.10	4.10	69.80	0.00	0.00	69.80	65.70	0.130	8.54	0.158	10.38	
20 2006	0.00	4.10	4.10	76.60	0.00	0.00	76.60	72.50	0.116	8.42	0.143	10.34	
21 2007	0.00	4.10	4.10	83.60	0.00	0.00	83.60	79.50	0.104	8.24	0.129	10.23	
22 2008	0.00	4.10	4.10	91.00	0.00	0.00	91.00	86.90	0.093	8.04	0.116	10.09	
23 2009	0.00	4.10	4.10	98.70	0.00	0.00	98.70	94.60	0.083	7.82	0.105	9.92	
24 2010	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.074	7.08	0.095	9.07	
25 2011	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.066	6.32	0.085	8.19	
26 2012	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.059	5.64	0.077	7.39	
27 2013	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.053	5.04	0.070	6.67	
28 2014	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.047	4.50	0.063	6.02	
29 2015	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.042	4.02	0.057	5.44	
30 2016	4.10	4.10	8.20	100.00	0.00	0.00	100.00	91.80	0.037	3.43	0.051	4.70	
31 2017	13.90	4.10	18.00	100.00	0.00	0.00	100.00	82.00	0.033	2.74	0.046	3.79	
32 2018	13.40	4.10	17.50	100.00	0.00	0.00	100.00	82.50	0.030	2.46	0.042	3.44	
33 2019	9.30	4.10	13.40	100.00	0.00	0.00	100.00	86.60	0.027	2.30	0.038	3.26	
34 2020	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.024	2.28	0.034	3.26	
35 2021	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.021	2.03	0.031	2.94	
36 2022	4.70	4.10	8.80	100.00	0.00	0.00	100.00	91.20	0.019	1.73	0.028	2.52	
37 2023	3.80	4.10	7.90	100.00	0.00	0.00	100.00	92.10	0.017	1.56	0.025	2.30	
38 2024	0.90	4.10	5.00	100.00	0.00	0.00	100.00	95.00	0.015	1.43	0.023	2.14	
39 2025	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.013	1.25	0.020	1.95	
40 2026	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.012	1.19	0.018	1.76	
41 2027	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.011	1.03	0.017	1.59	
42 2028	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.010	0.92	0.015	1.43	
43 2029	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.009	0.82	0.013	1.29	
44 2030	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.008	0.73	0.012	1.17	
45 2031	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.007	0.65	0.011	1.05	
46 2032	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.006	0.58	0.010	0.95	
47 2033	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.005	0.52	0.009	0.86	
48 2034	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.005	0.47	0.008	0.78	
49 2035	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.004	0.42	0.007	0.70	
50 2036	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.004	0.37	0.007	0.63	
51 2037	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.003	0.33	0.006	0.57	
52 2038	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.003	0.30	0.005	0.51	
53 2039	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.003	0.26	0.005	0.46	
54 2040	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.002	0.24	0.004	0.42	
55 2041	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.002	0.21	0.004	0.38	
56 2042	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.002	0.19	0.004	0.34	
57 2043	0.00	4.10	4.10	100.00	0.00	0.00	100.00	95.90	0.002	0.17	0.003	0.31	
TOTAL	434.60	198.00	632.60	4207.30	0.00	0.00	4207.30	3574.70		-35.06		0.00	

Total construction cost = US\$384.5 mil.
Replacement cost = US\$50.1 million

kwh value (domestic) = 0.056 US\$/kwh
kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
Present value (B) = 199
Present value (C) = 234
B/C = 0.8
B-C = -35
IRR = 10.8%

Table 13-16 Financial Internal Rate of Return

(Stage-1&2, 402 MW)

UNIT: MILLION US\$

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (14.89%)	NET PRESENT VALUE	
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT	USEFUL CAPACITY						TOTAL BENEFITS
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.870	-17.06
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.758	-15.61
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.659	-14.97
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.574	-27.55
6	1992	74.60	0.00	74.60	0.00	0.00	0.00	0.00	-74.60	0.567	-42.33	0.500	-37.26
7	1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.435	-50.43
8	1994	62.30	1.90	64.20	10.40	0.00	0.00	10.40	-53.80	0.452	-24.34	0.378	-20.36
9	1995	12.10	1.90	14.00	14.90	0.00	0.00	14.90	0.90	0.404	0.36	0.329	0.30
10	1996	20.00	1.90	21.90	19.30	0.00	0.00	19.30	-2.60	0.361	-0.94	0.287	-0.75
11	1997	69.90	1.90	71.80	24.10	0.00	0.00	24.10	-47.70	0.322	-15.36	0.250	-11.90
12	1998	42.90	1.90	44.80	29.00	0.00	0.00	29.00	-15.80	0.287	-4.54	0.217	-3.43
13	1999	5.20	5.70	10.90	34.20	105.00	0.00	139.20	128.30	0.257	32.93	0.189	24.25
14	2000	0.00	5.70	5.70	39.50	100.90	0.00	140.40	134.70	0.229	30.87	0.165	22.16
15	2001	0.00	5.70	5.70	45.10	96.70	0.00	141.80	136.10	0.205	27.85	0.143	19.49
16	2002	0.00	5.70	5.70	50.90	92.20	0.00	143.10	137.40	0.183	25.10	0.125	17.13
17	2003	0.00	5.70	5.70	56.90	87.60	0.00	144.50	138.80	0.163	22.64	0.108	15.06
18	2004	0.00	5.70	5.70	62.30	82.80	0.00	146.10	140.40	0.146	20.45	0.094	13.26
19	2005	0.00	5.70	5.70	69.80	77.90	0.00	147.70	142.00	0.130	18.47	0.082	11.67
20	2006	0.00	5.70	5.70	76.60	72.70	0.00	149.30	143.60	0.116	16.67	0.072	10.27
21	2007	0.00	5.70	5.70	83.60	67.30	0.00	150.90	145.20	0.104	15.05	0.062	9.04
22	2008	0.00	5.70	5.70	91.00	61.70	0.00	152.70	147.00	0.093	13.61	0.054	7.97
23	2009	0.00	5.70	5.70	98.70	55.80	0.00	154.50	148.80	0.083	12.30	0.047	7.02
24	2010	0.00	5.70	5.70	106.70	49.70	0.00	156.40	150.70	0.074	11.12	0.041	6.19
25	2011	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.066	9.95	0.036	5.40
26	2012	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.059	8.99	0.031	4.70
27	2013	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.053	7.94	0.027	4.09
28	2014	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.047	7.09	0.024	3.56
29	2015	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.042	6.33	0.021	3.10
30	2016	4.10	5.70	9.80	108.20	48.60	0.00	156.80	147.00	0.037	5.56	0.018	2.62
31	2017	13.90	5.70	19.60	108.20	48.60	0.00	156.80	137.20	0.033	4.58	0.016	2.13
32	2018	13.40	5.70	19.10	108.20	48.60	0.00	156.80	137.70	0.030	4.10	0.014	1.86
33	2019	9.30	5.70	15.00	108.20	48.60	0.00	156.80	141.80	0.027	3.77	0.012	1.67
34	2020	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.024	3.59	0.010	1.55
35	2021	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.021	3.21	0.009	1.35
36	2022	23.40	5.70	29.10	108.20	48.60	0.00	156.80	127.70	0.019	2.42	0.008	0.99
37	2023	18.90	5.70	24.60	108.20	48.60	0.00	156.80	132.20	0.017	2.24	0.007	0.89
38	2024	4.00	5.70	9.70	108.20	48.60	0.00	156.80	147.10	0.015	2.22	0.006	0.86
39	2025	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.013	2.04	0.005	0.77
40	2026	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.012	1.82	0.004	0.67
41	2027	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.011	1.62	0.004	0.59
42	2028	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.010	1.45	0.003	0.51
43	2029	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.009	1.29	0.003	0.44
44	2030	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.008	1.16	0.003	0.39
45	2031	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.007	1.03	0.002	0.34
46	2032	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.006	0.92	0.002	0.29
47	2033	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.005	0.82	0.002	0.25
48	2034	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.005	0.73	0.001	0.22
49	2035	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.004	0.66	0.001	0.19
50	2036	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.004	0.59	0.001	0.17
51	2037	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.003	0.52	0.001	0.15
52	2038	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.003	0.47	0.001	0.13
53	2039	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.003	0.42	0.001	0.11
54	2040	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.002	0.37	0.001	0.10
55	2041	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.002	0.33	0.001	0.08
56	2042	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.002	0.30	0.000	0.07
57	2043	0.00	5.70	5.70	108.20	48.60	0.00	156.80	151.10	0.002	0.26	0.000	0.06
TOTAL		605.70	266.00	871.70	4484.60	2554.10	0.00	7038.70	6167.00		104.38		-0.00

Total construction cost = US\$518.7 mil.
 Replacement cost = US\$87.0 million

kwh value (domestic) = 0.056 US\$/kwh
 kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
 Present value (B) = 386
 Present value (C) = 282
 B/C = 1.4
 B-C = 104
 IRR = 14.9%

Table 13-17 Sensitivity Analysis of FIRR

(201 MW: Cost +10%)

MILLION US\$

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (10.11%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY					
1	1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	-21.60	0.893	-19.29	0.906	-19.62
3	1989	22.70	0.00	22.70	0.00	0.00	0.00	-22.70	0.797	-18.10	0.825	-18.72
4	1990	25.00	0.00	25.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.749	-18.72
5	1991	52.80	0.00	52.80	0.00	0.00	0.00	-52.80	0.536	-33.56	0.680	-35.91
6	1992	82.10	0.00	82.10	0.00	0.00	0.00	-82.10	0.367	-46.59	0.618	-50.71
7	1993	127.60	0.00	127.60	0.00	0.00	0.00	-127.60	0.267	-64.65	0.561	-71.58
8	1994	61.50	3.00	64.50	10.40	0.00	10.40	-54.10	0.452	-24.47	0.509	-27.56
9	1995	0.00	3.00	3.00	14.99	0.00	14.99	11.99	0.404	4.81	0.463	5.51
10	1996	0.00	3.00	3.00	19.30	0.00	19.30	16.30	0.351	5.88	0.420	6.85
11	1997	6.10	3.00	9.10	24.10	0.00	24.10	15.00	0.322	4.83	0.382	5.72
12	1998	12.30	3.00	15.30	29.00	0.00	29.00	13.70	0.287	3.94	0.347	4.75
13	1999	6.20	4.50	10.70	34.20	0.00	34.20	23.50	0.257	6.03	0.315	7.40
14	2000	0.00	4.50	4.50	39.50	0.00	39.50	35.00	0.229	8.02	0.286	10.00
15	2001	0.00	4.50	4.50	45.10	0.00	45.10	40.60	0.205	8.31	0.260	10.54
16	2002	0.00	4.50	4.50	50.90	0.00	50.90	46.40	0.183	8.48	0.236	10.94
17	2003	0.00	4.50	4.50	56.90	0.00	56.90	52.40	0.163	8.55	0.214	11.22
18	2004	0.00	4.50	4.50	63.30	0.00	63.30	58.80	0.146	8.56	0.194	11.43
19	2005	0.00	4.50	4.50	69.80	0.00	69.80	65.30	0.130	8.49	0.177	11.53
20	2006	0.00	4.50	4.50	76.60	0.00	76.60	72.10	0.116	8.37	0.160	11.56
21	2007	0.00	4.50	4.50	83.60	0.00	83.60	79.10	0.104	8.20	0.146	11.52
22	2008	0.00	4.50	4.50	91.00	0.00	91.00	86.50	0.093	8.01	0.132	11.44
23	2009	0.00	4.50	4.50	98.70	0.00	98.70	94.20	0.083	7.78	0.120	11.31
24	2010	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.074	7.05	0.109	10.41
25	2011	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.066	6.29	0.099	9.46
26	2012	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.059	5.62	0.090	8.59
27	2013	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.053	5.02	0.082	7.80
28	2014	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.047	4.48	0.074	7.08
29	2015	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.042	4.00	0.067	6.43
30	2016	4.50	4.50	9.00	100.00	0.00	100.00	91.00	0.037	3.40	0.061	5.57
31	2017	15.30	4.50	19.80	100.00	0.00	100.00	89.20	0.033	2.68	0.056	4.46
32	2018	14.70	4.50	19.20	100.00	0.00	100.00	80.80	0.030	2.41	0.050	4.08
33	2019	10.20	4.50	14.70	100.00	0.00	100.00	85.30	0.027	2.27	0.046	3.91
34	2020	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.024	2.27	0.042	3.97
35	2021	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.021	2.03	0.038	3.61
36	2022	5.20	4.50	9.70	100.00	0.00	100.00	90.30	0.019	1.71	0.034	3.10
37	2023	4.20	4.50	8.70	100.00	0.00	100.00	91.30	0.017	1.54	0.031	2.85
38	2024	1.00	4.50	5.50	100.00	0.00	100.00	94.50	0.015	1.43	0.028	2.67
39	2025	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.013	1.29	0.026	2.45
40	2026	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.012	1.15	0.023	2.23
41	2027	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.011	1.03	0.021	2.02
42	2028	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.010	0.92	0.019	1.84
43	2029	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.009	0.82	0.017	1.67
44	2030	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.008	0.73	0.016	1.52
45	2031	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.007	0.65	0.014	1.38
46	2032	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.006	0.58	0.013	1.25
47	2033	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.005	0.52	0.012	1.14
48	2034	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.005	0.46	0.011	1.03
49	2035	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.004	0.41	0.010	0.94
50	2036	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.004	0.37	0.009	0.85
51	2037	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.003	0.33	0.008	0.77
52	2038	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.003	0.30	0.007	0.70
53	2039	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.003	0.26	0.007	0.64
54	2040	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.002	0.24	0.006	0.58
55	2041	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.002	0.21	0.006	0.53
56	2042	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.002	0.19	0.005	0.48
57	2043	0.00	4.50	4.50	100.00	0.00	100.00	95.50	0.002	0.17	0.005	0.43
TOTAL		478.30	217.50	695.80	4207.30	0.00	4207.30	3511.50		-58.68		0.00

Total construction cost = US\$423.2 mil.

Replacement cost = US\$55.1 million

kwh value (domestic) = 0.056 US\$/kwh

kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%

Present value (B) = 199

Present value (C) = 258

B/C = 0.8

B-C = -59

IRR = 10.1%

Table 13-18 Sensitivity Analysis of FIRR

(201 MW: Benefit -10%)

(UNIT: MILLION US\$)

NO.	YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (10.05%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.909	-17.81
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.826	-17.01
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.750	-17.03
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.60	0.682	-32.73
6	1992	74.50	0.00	74.50	0.00	0.00	0.00	0.00	-74.50	0.567	-42.33	0.620	-46.22
7	1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.563	-65.31
8	1994	55.90	2.70	58.60	9.40	0.00	0.00	9.40	-49.20	0.452	-22.26	0.512	-25.17
9	1995	0.00	2.70	2.70	13.40	0.00	0.00	13.40	10.70	0.404	4.32	0.465	4.97
10	1996	0.00	2.70	2.70	17.40	0.00	0.00	17.40	14.70	0.361	5.30	0.422	6.21
11	1997	5.50	2.70	8.20	21.70	0.00	0.00	21.70	13.50	0.322	4.35	0.384	5.18
12	1998	11.20	2.70	13.90	26.10	0.00	0.00	26.10	12.20	0.287	3.51	0.349	4.26
13	1999	5.60	4.10	9.70	30.70	0.00	0.00	30.70	21.00	0.257	5.39	0.317	6.66
14	2000	0.00	4.10	4.10	35.60	0.00	0.00	35.60	31.50	0.229	7.22	0.288	9.07
15	2001	0.00	4.10	4.10	40.60	0.00	0.00	40.60	36.50	0.205	7.47	0.262	9.55
16	2002	0.00	4.10	4.10	45.80	0.00	0.00	45.80	41.70	0.183	7.62	0.238	9.92
17	2003	0.00	4.10	4.10	51.20	0.00	0.00	51.20	47.10	0.163	7.68	0.216	10.18
18	2004	0.00	4.10	4.10	57.00	0.00	0.00	57.00	52.90	0.146	7.70	0.196	10.39
19	2005	0.00	4.10	4.10	62.80	0.00	0.00	62.80	58.70	0.130	7.63	0.178	10.47
20	2006	0.00	4.10	4.10	68.90	0.00	0.00	68.90	64.80	0.116	7.52	0.162	10.51
21	2007	0.00	4.10	4.10	75.20	0.00	0.00	75.20	71.10	0.104	7.37	0.147	10.48
22	2008	0.00	4.10	4.10	81.90	0.00	0.00	81.90	77.80	0.093	7.20	0.134	10.42
23	2009	0.00	4.10	4.10	88.80	0.00	0.00	88.80	84.70	0.083	7.00	0.122	10.30
24	2010	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.074	6.34	0.111	9.50
25	2011	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.066	5.66	0.100	8.63
26	2012	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.059	5.05	0.091	7.84
27	2013	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.053	4.51	0.083	7.13
28	2014	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.047	4.03	0.075	6.47
29	2015	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.042	3.60	0.068	5.98
30	2016	4.10	4.10	8.20	90.00	0.00	0.00	90.00	81.80	0.037	3.06	0.062	5.09
31	2017	13.90	4.10	18.00	90.00	0.00	0.00	90.00	72.00	0.033	2.40	0.057	4.07
32	2018	13.40	4.10	17.50	90.00	0.00	0.00	90.00	72.50	0.030	2.16	0.051	3.73
33	2019	9.30	4.10	13.40	90.00	0.00	0.00	90.00	76.60	0.027	2.04	0.047	3.58
34	2020	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.024	2.04	0.042	3.65
35	2021	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.021	1.82	0.039	3.31
36	2022	4.70	4.10	8.80	90.00	0.00	0.00	90.00	81.20	0.019	1.54	0.035	2.85
37	2023	1.80	4.10	7.90	90.00	0.00	0.00	90.00	82.10	0.017	1.39	0.032	2.61
38	2024	0.90	4.10	5.00	90.00	0.00	0.00	90.00	85.00	0.015	1.28	0.029	2.46
39	2025	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.013	1.16	0.026	2.26
40	2026	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.012	1.03	0.024	2.05
41	2027	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.011	0.92	0.022	1.86
42	2028	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.010	0.82	0.020	1.69
43	2029	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.009	0.74	0.018	1.54
44	2030	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.008	0.66	0.016	1.40
45	2031	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.007	0.59	0.015	1.27
46	2032	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.006	0.52	0.013	1.16
47	2033	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.005	0.47	0.012	1.05
48	2034	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.005	0.42	0.011	0.95
49	2035	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.004	0.37	0.010	0.87
50	2036	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.004	0.33	0.009	0.79
51	2037	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.003	0.30	0.008	0.72
52	2038	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.003	0.27	0.008	0.65
53	2039	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.003	0.24	0.007	0.59
54	2040	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.002	0.21	0.006	0.54
55	2041	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.002	0.19	0.006	0.49
56	2042	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.002	0.17	0.005	0.44
57	2043	0.00	4.10	4.10	90.00	0.00	0.00	90.00	85.90	0.002	0.15	0.005	0.40
TOTAL		434.60	198.00	632.60	3786.50	0.00	0.00	3786.50	3153.90		-54.98		-0.00

Total construction cost = US\$384.5 mil.
 Replacement cost = US\$50.1 million

kwh value (domestic) = 0.056 US\$/kwh
 kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
 Present value (B) = 179
 Present value (C) = 234
 B/C = 0.8
 B-C = -55
 IRR = 10.0%

Table 13-19 Sensitivity Analysis of FIRR

(201 MW: Cost +10%, Benefit -10%)

(UNIT: MILLION US\$)

NO.	YEAR	COSTS			BENEFITS			BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (9.39%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY					
1	1987	3.30	0.00	3.30	0.00	0.00	0.00	0.00	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	-21.60	0.893	-19.29	0.914	-19.75
3	1989	22.70	0.00	22.70	0.00	0.00	0.00	-22.70	0.797	-18.10	0.836	-18.97
4	1990	25.00	0.00	25.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.764	-19.10
5	1991	52.80	0.00	52.80	0.00	0.00	0.00	-52.80	0.636	-33.56	0.698	-36.87
6	1992	82.10	0.00	82.10	0.00	0.00	0.00	-82.10	0.567	-46.59	0.638	-52.41
7	1993	127.60	0.00	127.60	0.00	0.00	0.00	-127.60	0.507	-64.65	0.584	-74.46
8	1994	61.50	3.00	64.50	9.40	0.00	9.40	-55.10	0.452	-24.92	0.533	-29.39
9	1995	0.00	3.00	3.00	13.40	0.00	13.40	10.40	0.404	4.20	0.488	5.07
10	1996	0.00	3.00	3.00	17.40	0.00	17.40	14.40	0.361	5.19	0.446	6.42
11	1997	6.10	3.00	9.10	21.70	0.00	21.70	12.60	0.322	4.06	0.408	5.13
12	1998	12.30	3.00	15.30	26.10	0.00	26.10	10.80	0.287	3.10	0.373	4.02
13	1999	6.20	4.50	10.70	30.70	0.00	30.70	20.00	0.257	5.13	0.341	6.81
14	2000	0.00	4.50	4.50	35.60	0.00	35.60	31.10	0.229	7.13	0.311	9.68
15	2001	0.00	4.50	4.50	40.60	0.00	40.60	36.10	0.205	7.39	0.285	10.27
16	2002	0.00	4.50	4.50	45.80	0.00	45.80	41.30	0.183	7.55	0.260	10.74
17	2003	0.00	4.50	4.50	51.20	0.00	51.20	46.70	0.163	7.62	0.238	11.11
18	2004	0.00	4.50	4.50	57.00	0.00	57.00	52.50	0.145	7.65	0.217	11.41
19	2005	0.00	4.50	4.50	62.80	0.00	62.80	58.30	0.130	7.58	0.199	11.59
20	2006	0.00	4.50	4.50	68.90	0.00	68.90	64.40	0.116	7.48	0.182	11.70
21	2007	0.00	4.50	4.50	75.20	0.00	75.20	70.70	0.104	7.33	0.166	11.74
22	2008	0.00	4.50	4.50	81.90	0.00	81.90	77.40	0.093	7.16	0.152	11.75
23	2009	0.00	4.50	4.50	88.80	0.00	88.80	84.30	0.083	6.97	0.139	11.70
24	2010	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.074	6.31	0.127	10.85
25	2011	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.066	5.63	0.116	9.92
26	2012	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.059	5.03	0.106	9.06
27	2013	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.053	4.49	0.097	8.29
28	2014	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.047	4.01	0.089	7.58
29	2015	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.042	3.58	0.081	6.92
30	2016	4.50	4.50	9.00	90.00	0.00	90.00	81.00	0.037	3.03	0.074	6.00
31	2017	15.30	4.50	19.80	90.00	0.00	90.00	70.20	0.033	2.34	0.068	4.75
32	2018	14.70	4.50	19.20	90.00	0.00	90.00	70.80	0.030	2.11	0.062	4.38
33	2019	10.20	4.50	14.70	90.00	0.00	90.00	75.30	0.027	2.00	0.057	4.26
34	2020	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.024	2.03	0.052	4.42
35	2021	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.021	1.81	0.047	4.04
36	2022	5.20	4.50	9.70	90.00	0.00	90.00	80.30	0.019	1.52	0.043	3.47
37	2023	4.20	4.50	8.70	90.00	0.00	90.00	81.30	0.017	1.37	0.039	3.21
38	2024	1.00	4.50	5.50	90.00	0.00	90.00	84.50	0.015	1.28	0.036	3.05
39	2025	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.013	1.15	0.033	2.82
40	2026	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.012	1.03	0.030	2.58
41	2027	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.011	0.92	0.028	2.36
42	2028	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.010	0.82	0.025	2.16
43	2029	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.009	0.73	0.023	1.97
44	2030	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.008	0.65	0.021	1.80
45	2031	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.007	0.58	0.019	1.65
46	2032	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.006	0.52	0.018	1.51
47	2033	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.005	0.47	0.016	1.38
48	2034	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.005	0.42	0.015	1.26
49	2035	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.004	0.37	0.013	1.15
50	2036	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.004	0.33	0.012	1.05
51	2037	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.003	0.30	0.011	0.96
52	2038	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.003	0.26	0.010	0.88
53	2039	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.003	0.24	0.009	0.80
54	2040	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.002	0.21	0.009	0.73
55	2041	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.002	0.19	0.008	0.67
56	2042	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.002	0.17	0.007	0.61
57	2043	0.00	4.50	4.50	90.00	0.00	90.00	85.50	0.002	0.15	0.007	0.56
TOTAL		478.30	217.50	695.80	3786.50	0.00	0.00	3786.50	3090.70	-78.50		0.00

Total construction cost = US\$423.2 mil.

Replacement cost = US\$55.1 million

kwh value (domestic) = 0.056 US\$/kwh

kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%

Present value (B) = 179

Present value (C) = 258

B/C = 0.7

B-C = -79

IRR = 9.4%

Table 13-20 Sensitivity Analysis of FIRR

(201 MW: Power Export Decrease by 20 MW)

MILLION US\$													
NO.	YEAR	INVESTMENT AND REPLACEMENT	COSTS OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	BENEFITS SALABLE EXPORT, SURPLUS	USEFUL CAPACITY	TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (9.97%)	NET PRESENT VALUE
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.909	-17.82
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.827	-17.03
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.752	-17.07
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.635	-30.50	0.684	-32.82
6	1992	74.60	0.00	74.60	0.00	0.00	0.00	0.00	-74.60	0.567	-42.33	0.622	-46.39
7	1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.565	-65.59
8	1994	55.90	2.70	58.60	5.10	0.00	0.00	5.10	-53.50	0.452	-24.20	0.514	-27.51
9	1995	0.00	2.70	2.70	9.40	0.00	0.00	9.40	6.70	0.404	2.71	0.468	3.13
10	1996	0.00	2.70	2.70	13.70	0.00	0.00	13.70	11.00	0.361	3.97	0.425	4.68
11	1997	5.50	2.70	8.20	18.30	0.00	0.00	18.30	10.10	0.322	3.25	0.387	3.91
12	1998	11.20	2.70	13.90	23.10	0.00	0.00	23.10	9.20	0.287	2.64	0.352	3.23
13	1999	5.60	4.10	9.70	28.00	0.00	0.00	28.00	18.30	0.257	4.70	0.320	5.85
14	2000	0.00	4.10	4.10	33.20	0.00	0.00	33.20	29.10	0.229	6.67	0.291	8.46
15	2001	0.00	4.10	4.10	38.50	0.00	0.00	38.50	34.50	0.205	7.05	0.264	9.12
16	2002	0.00	4.10	4.10	44.20	0.00	0.00	44.20	40.10	0.183	7.33	0.240	9.64
17	2003	0.00	4.10	4.10	50.00	0.00	0.00	50.00	45.90	0.163	7.49	0.219	10.04
18	2004	0.00	4.10	4.10	56.10	0.00	0.00	56.10	52.00	0.146	7.57	0.199	10.34
19	2005	0.00	4.10	4.10	62.40	0.00	0.00	62.40	58.30	0.130	7.58	0.181	10.54
20	2006	0.00	4.10	4.10	68.90	0.00	0.00	68.90	64.80	0.116	7.52	0.164	10.65
21	2007	0.60	4.10	4.10	75.70	0.00	0.00	75.70	71.60	0.104	7.42	0.149	10.70
22	2008	0.00	4.10	4.10	82.80	0.00	0.00	82.80	78.70	0.093	7.28	0.136	10.70
23	2009	0.00	4.10	4.10	90.20	0.00	0.00	90.20	86.10	0.083	7.12	0.124	10.64
24	2010	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.074	6.81	0.112	10.38
25	2011	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.066	6.08	0.102	9.44
26	2012	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.059	5.43	0.093	8.58
27	2013	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.053	4.85	0.085	7.80
28	2014	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.047	4.33	0.077	7.09
29	2015	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.042	3.86	0.070	6.45
30	2016	4.10	4.10	8.20	96.40	0.00	0.00	96.40	88.20	0.037	3.30	0.064	5.61
31	2017	13.90	4.10	18.00	96.40	0.00	0.00	96.40	78.40	0.033	2.62	0.058	4.53
32	2018	13.40	4.10	17.50	96.40	0.00	0.00	96.40	78.90	0.030	2.35	0.053	4.15
33	2019	9.30	4.10	13.40	96.40	0.00	0.00	96.40	83.00	0.027	2.21	0.048	3.97
34	2020	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.024	2.19	0.043	4.01
35	2021	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.021	1.96	0.040	3.65
36	2022	4.70	4.10	8.80	96.40	0.00	0.00	96.40	87.60	0.019	1.66	0.036	3.15
37	2023	3.80	4.10	7.90	96.40	0.00	0.00	96.40	88.50	0.017	1.50	0.033	2.89
38	2024	0.90	4.10	5.00	96.40	0.00	0.00	96.40	91.40	0.015	1.38	0.030	2.72
39	2025	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.013	1.24	0.027	2.49
40	2026	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.012	1.11	0.025	2.27
41	2027	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.011	0.99	0.022	2.06
42	2028	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.010	0.89	0.020	1.88
43	2029	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.009	0.79	0.018	1.71
44	2030	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.008	0.71	0.017	1.55
45	2031	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.007	0.63	0.015	1.41
46	2032	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.006	0.56	0.014	1.28
47	2033	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.005	0.50	0.013	1.17
48	2034	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.005	0.45	0.011	1.06
49	2035	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.004	0.40	0.010	0.96
50	2036	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.004	0.36	0.010	0.88
51	2037	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.003	0.32	0.009	0.80
52	2038	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.003	0.29	0.008	0.73
53	2039	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.003	0.25	0.007	0.66
54	2040	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.002	0.23	0.006	0.60
55	2041	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.002	0.20	0.006	0.55
56	2042	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.002	0.18	0.005	0.50
57	2043	0.00	4.10	4.10	96.40	0.00	0.00	96.40	92.30	0.002	0.16	0.005	0.45
TOTAL		434.60	198.00	632.60	3977.30	0.00	0.00	3977.30	3344.70		-59.59		0.00

Total construction cost = US\$384.5 mil.
 Replacement cost = US\$50.1 million

kwh value (domestic) = 0.056 US\$/kwh
 kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
 Present value (B) = 175
 Present value (C) = 234
 B/C = 0.8
 B-C = -59
 IRR = 10.0%

Table 13-21 Sensitivity Analysis of FIRR

(402 MW: Cost +10%)

UNIT: MILLION US\$

NO. YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (13.98%)	NET PRESENT VALUE
	INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						
1 1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	-5.30	1.000	-5.30	1.000	-5.30
2 1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	-21.60	0.893	-19.29	0.877	-18.95
3 1989	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.797	-18.10	0.770	-17.47
4 1990	25.00	0.00	25.00	0.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.675	-16.88
5 1991	52.80	0.00	52.80	0.00	0.00	0.00	0.00	-52.80	0.636	-33.56	0.593	-31.29
6 1992	82.10	0.00	82.10	0.00	0.00	0.00	0.00	-82.10	0.567	-46.59	0.520	-42.68
7 1993	127.60	0.00	127.60	0.00	0.00	0.00	0.00	-127.60	0.507	-64.65	0.455	-58.20
8 1994	68.50	2.10	70.60	10.40	0.00	0.00	10.40	-60.20	0.452	-27.23	0.400	-24.09
9 1995	13.30	2.10	15.40	14.90	0.00	0.00	14.90	-0.50	0.404	-0.20	0.351	-0.18
10 1996	22.00	2.10	24.10	19.30	0.00	0.00	19.30	-4.80	0.361	-1.73	0.308	-1.48
11 1997	76.90	2.10	79.00	24.10	0.00	0.00	24.10	-54.90	0.322	-17.68	0.270	-14.84
12 1998	47.20	2.10	49.30	29.00	0.00	0.00	29.00	-20.30	0.287	-5.84	0.237	-4.81
13 1999	5.70	6.30	12.00	34.20	105.00	0.00	139.20	127.20	0.257	32.65	0.208	26.47
14 2000	0.00	6.30	6.30	39.50	100.90	0.00	140.40	134.10	0.229	30.73	0.183	24.48
15 2001	0.00	6.30	6.30	45.10	95.70	0.00	141.80	135.50	0.205	27.73	0.160	21.70
16 2002	0.00	6.30	6.30	50.90	92.20	0.00	143.10	136.80	0.183	24.29	0.141	19.22
17 2003	0.00	6.30	6.30	56.90	87.60	0.00	144.50	138.20	0.163	22.54	0.123	17.04
18 2004	0.00	6.30	6.30	63.30	82.80	0.00	146.10	139.80	0.146	20.36	0.108	15.12
19 2005	0.00	6.30	6.30	69.80	77.90	0.00	147.70	141.40	0.130	18.39	0.095	13.42
20 2006	0.00	6.30	6.30	76.60	72.70	0.00	149.30	143.00	0.116	16.60	0.083	11.91
21 2007	0.00	6.30	6.30	83.60	67.30	0.00	150.90	144.60	0.104	14.99	0.073	10.56
22 2008	0.00	6.30	6.30	91.00	61.70	0.00	152.70	146.40	0.093	13.55	0.064	9.38
23 2009	0.00	6.30	6.30	98.70	55.00	0.00	154.50	148.20	0.083	12.25	0.056	8.34
24 2010	0.00	6.30	6.30	106.70	47.20	0.00	156.40	150.10	0.074	11.08	0.049	7.41
25 2011	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.066	9.92	0.043	6.52
26 2012	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.059	8.85	0.038	5.72
27 2013	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.053	7.90	0.033	5.02
28 2014	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.047	7.06	0.029	4.40
29 2015	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.042	6.30	0.026	3.86
30 2016	4.50	6.30	10.80	108.20	48.60	0.00	156.80	146.00	0.037	5.46	0.023	3.29
31 2017	15.30	6.30	21.60	108.20	48.60	0.00	156.80	135.20	0.033	4.51	0.020	2.67
32 2018	14.70	6.30	21.00	108.20	48.60	0.00	156.80	135.80	0.030	4.05	0.017	2.35
33 2019	10.20	6.30	16.50	108.20	48.60	0.00	156.80	140.30	0.027	3.73	0.015	2.13
34 2020	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.024	3.58	0.013	2.01
35 2021	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.021	3.19	0.012	1.76
36 2022	25.70	6.30	32.00	108.20	48.60	0.00	156.80	124.80	0.017	2.36	0.010	1.28
37 2023	20.80	6.30	27.10	108.20	48.60	0.00	156.80	129.70	0.017	2.19	0.009	1.17
38 2024	4.40	6.30	10.70	108.20	48.60	0.00	156.80	146.10	0.015	2.21	0.008	1.15
39 2025	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.013	2.03	0.007	1.04
40 2026	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.012	1.81	0.006	0.92
41 2027	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.011	1.62	0.005	0.80
42 2028	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.010	1.44	0.005	0.70
43 2029	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.009	1.29	0.004	0.62
44 2030	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.008	1.15	0.004	0.54
45 2031	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.007	1.03	0.003	0.48
46 2032	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.006	0.92	0.003	0.42
47 2033	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.005	0.82	0.002	0.37
48 2034	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.005	0.73	0.002	0.32
49 2035	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.004	0.65	0.002	0.28
50 2036	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.004	0.58	0.002	0.25
51 2037	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.003	0.52	0.001	0.22
52 2038	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.003	0.46	0.001	0.19
53 2039	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.003	0.42	0.001	0.17
54 2040	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.002	0.37	0.001	0.15
55 2041	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.002	0.33	0.001	0.13
56 2042	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.002	0.30	0.001	0.11
57 2043	0.00	6.30	6.30	108.20	48.60	0.00	156.80	150.50	0.002	0.26	0.001	0.10
TOTAL	666.30	294.00	960.30	4484.60	2554.10	0.00	7038.70	6078.40		75.97		-0.00

Total construction cost = US\$570.7 mil.
Replacement cost = US\$95.6 million

kwh value (domestic) = 0.056 US\$/kwh
kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
Present value (B) = 386
Present value (C) = 310
B/C = 1.2
B-C = 76
IRR = 14.0%

Table 13-22 Sensitivity Analysis of FIRR

(402 MW: Benefit -10%)

MILLION US\$													
NO.	YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (13.89%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.878	-17.21
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.771	-15.88
4	1990	32.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.677	-15.37
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.594	-28.53
6	1992	74.60	0.00	74.60	0.00	0.00	0.00	0.00	-74.60	0.567	-42.33	0.522	-38.94
7	1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.458	-53.16
8	1994	62.30	1.90	64.20	9.40	0.00	0.00	9.40	-54.80	0.452	-24.79	0.402	-22.05
9	1995	12.10	1.90	14.00	13.40	0.00	0.00	13.40	-0.60	0.404	-0.24	0.353	-0.21
10	1996	20.00	1.90	21.90	17.40	0.00	0.00	17.40	-4.50	0.361	-1.62	0.310	-1.40
11	1997	69.90	1.90	71.80	21.70	0.00	0.00	21.70	-50.10	0.322	-18.13	0.272	-13.65
12	1998	42.90	1.90	44.80	25.10	0.00	0.00	25.10	-18.70	0.287	-5.38	0.239	-4.47
13	1999	5.20	5.70	10.90	30.70	94.50	0.00	125.20	114.30	0.257	29.34	0.210	21.01
14	2000	0.00	5.70	5.70	35.60	90.80	0.00	126.40	120.70	0.229	27.66	0.184	22.26
15	2001	0.00	5.70	5.70	40.60	87.00	0.00	127.60	121.90	0.205	24.94	0.162	19.74
16	2002	0.00	5.70	5.70	45.80	83.00	0.00	128.80	123.10	0.183	22.49	0.142	17.50
17	2003	0.00	5.70	5.70	51.20	78.80	0.00	130.00	124.30	0.163	20.28	0.125	15.52
18	2004	0.00	5.70	5.70	57.00	74.50	0.00	131.50	125.80	0.146	18.32	0.110	13.79
19	2005	0.00	5.70	5.70	62.80	70.10	0.00	132.90	127.20	0.130	16.54	0.096	12.24
20	2006	0.00	5.70	5.70	68.90	65.40	0.00	134.30	128.60	0.116	14.93	0.085	10.87
21	2007	0.00	5.70	5.70	75.20	60.60	0.00	135.80	130.10	0.104	13.49	0.074	9.65
22	2008	0.00	5.70	5.70	81.90	55.50	0.00	137.40	131.70	0.093	12.19	0.065	8.58
23	2009	0.00	5.70	5.70	88.80	50.20	0.00	139.00	133.30	0.083	11.02	0.057	7.63
24	2010	0.00	5.70	5.70	96.00	44.70	0.00	140.70	135.00	0.074	9.96	0.050	6.78
25	2011	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.066	8.92	0.044	5.97
26	2012	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.059	7.96	0.039	5.24
27	2013	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.053	7.11	0.034	4.60
28	2014	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.047	6.35	0.030	4.04
29	2015	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.042	5.67	0.026	3.55
30	2016	4.10	5.70	9.80	97.40	43.70	0.00	141.10	131.30	0.037	4.91	0.023	3.02
31	2017	13.90	5.70	19.60	97.40	43.70	0.00	141.10	121.50	0.033	4.06	0.020	2.46
32	2018	13.40	5.70	19.10	97.40	43.70	0.00	141.10	122.00	0.030	3.64	0.018	2.17
33	2019	9.30	5.70	15.00	97.40	43.70	0.00	141.10	126.10	0.027	3.36	0.016	1.97
34	2020	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.024	3.22	0.014	1.85
35	2021	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.021	2.87	0.012	1.63
36	2022	23.40	5.70	29.10	97.40	43.70	0.00	141.10	112.00	0.019	2.12	0.011	1.18
37	2023	18.90	5.70	24.60	97.40	43.70	0.00	141.10	116.50	0.017	1.97	0.009	1.08
38	2024	4.00	5.70	9.70	97.40	43.70	0.00	141.10	131.40	0.015	1.98	0.008	1.07
39	2025	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.013	1.83	0.007	0.97
40	2026	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.012	1.63	0.006	0.85
41	2027	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.011	1.46	0.006	0.75
42	2028	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.010	1.30	0.005	0.65
43	2029	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.009	1.15	0.004	0.57
44	2030	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.008	1.04	0.004	0.50
45	2031	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.007	0.92	0.003	0.44
46	2032	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.006	0.83	0.003	0.39
47	2033	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.005	0.74	0.003	0.34
48	2034	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.005	0.66	0.002	0.30
49	2035	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.004	0.59	0.002	0.26
50	2036	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.004	0.52	0.002	0.23
51	2037	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.003	0.47	0.002	0.20
52	2038	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.003	0.42	0.001	0.18
53	2039	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.003	0.37	0.001	0.16
54	2040	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.002	0.33	0.001	0.14
55	2041	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.002	0.30	0.001	0.12
56	2042	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.002	0.27	0.001	0.11
57	2043	0.00	5.70	5.70	97.40	43.70	0.00	141.10	135.40	0.002	0.24	0.001	0.09
TOTAL		605.70	266.00	871.70	4036.70	2297.20	0.00	6333.90	5462.20		65.71		-0.00

Total construction cost = US\$518.7 mil.
 Replacement cost = US\$87.0 million
 kwh value (domestic) = 0.056 US\$/kwh
 kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
 Present value (B) = 348
 Present value (C) = 282
 B/C = 1.2
 B-C = 66
 IRR = 14.0%

Table 13-23 Sensitivity Analysis of FIRR

(402 MW: Cost +10%, Benefit -10%)

No.	YEAR	COSTS			BENEFITS			TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (13.01%)	NET PRESENT VALUE
		INVESTMENT AND REPLACEMENT	OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	SALABLE EXPORT, SURPLUS	USEFUL CAPACITY						
1	1987	5.30	0.00	5.30	0.00	0.00	0.00	0.00	-5.30	1.000	-5.30	1.000	-5.30
2	1988	21.60	0.00	21.60	0.00	0.00	0.00	0.00	-21.60	0.893	-19.29	0.885	-19.11
3	1989	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.797	-18.10	0.783	-17.78
4	1990	25.00	0.00	25.00	0.00	0.00	0.00	0.00	-25.00	0.712	-17.79	0.693	-17.32
5	1991	52.80	0.00	52.80	0.00	0.00	0.00	0.00	-52.80	0.636	-33.56	0.613	-32.38
6	1992	82.10	0.00	82.10	0.00	0.00	0.00	0.00	-82.10	0.567	-46.59	0.543	-44.55
7	1993	127.60	0.00	127.60	0.00	0.00	0.00	0.00	-127.60	0.507	-64.65	0.480	-61.27
8	1994	68.50	2.10	70.60	9.40	0.00	0.00	9.40	-61.20	0.452	-27.68	0.425	-26.01
9	1995	13.30	2.10	15.40	13.40	0.00	0.00	13.40	-2.00	0.404	-0.81	0.376	-0.75
10	1996	22.00	2.10	24.10	17.40	0.00	0.00	17.40	-6.70	0.361	-2.42	0.333	-2.23
11	1997	76.90	2.10	79.00	21.70	0.00	0.00	21.70	-57.30	0.322	-18.45	0.294	-16.87
12	1998	47.20	2.10	49.30	26.10	0.00	0.00	26.10	-23.20	0.287	-6.67	0.261	-6.05
13	1999	5.70	6.30	12.00	30.70	94.50	0.00	125.20	113.20	0.257	29.06	0.231	26.10
14	2000	0.00	6.30	6.30	35.60	90.80	0.00	126.40	120.10	0.229	27.52	0.204	24.50
15	2001	0.00	6.30	6.30	40.60	87.00	0.00	127.60	121.30	0.205	24.82	0.181	21.90
16	2002	0.00	6.30	6.30	45.80	83.00	0.00	128.80	122.50	0.183	22.38	0.160	19.57
17	2003	0.00	6.30	6.30	51.20	78.80	0.00	130.00	123.70	0.163	20.18	0.141	17.49
18	2004	0.00	6.30	6.30	57.00	74.50	0.00	131.50	125.20	0.146	18.23	0.125	15.66
19	2005	0.00	6.30	6.30	52.80	70.10	0.00	132.90	126.60	0.130	16.46	0.111	14.02
20	2006	0.00	6.30	6.30	68.90	65.40	0.00	134.30	128.00	0.116	14.86	0.098	12.54
21	2007	0.00	6.30	6.30	75.20	60.60	0.00	135.80	129.50	0.104	13.42	0.087	11.23
22	2008	0.00	6.30	6.30	81.90	55.50	0.00	137.40	131.10	0.093	12.13	0.077	10.06
23	2009	0.00	6.30	6.30	88.80	50.20	0.00	139.00	132.70	0.083	10.97	0.068	9.01
24	2010	0.00	6.30	6.30	96.00	44.70	0.00	140.70	134.40	0.074	9.92	0.060	8.07
25	2011	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.066	8.88	0.053	7.17
26	2012	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.059	7.93	0.047	6.34
27	2013	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.053	7.08	0.042	5.61
28	2014	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.047	6.32	0.037	4.97
29	2015	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.042	5.64	0.033	4.39
30	2016	4.50	6.30	10.80	97.40	43.70	0.00	141.10	130.30	0.037	4.87	0.029	3.76
31	2017	15.30	6.30	21.60	97.40	43.70	0.00	141.10	119.50	0.033	3.99	0.026	3.05
32	2018	11.70	6.30	18.00	97.40	43.70	0.00	141.10	120.10	0.030	3.58	0.023	2.71
33	2019	10.20	6.30	16.50	97.40	43.70	0.00	141.10	124.60	0.027	3.32	0.020	2.49
34	2020	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.024	3.20	0.018	2.38
35	2021	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.021	2.86	0.016	2.11
36	2022	25.70	6.30	32.00	97.40	43.70	0.00	141.10	109.10	0.019	2.07	0.014	1.51
37	2023	20.80	6.30	27.10	97.40	43.70	0.00	141.10	114.00	0.017	1.93	0.012	1.40
38	2024	4.40	6.30	10.70	97.40	43.70	0.00	141.10	130.40	0.015	1.97	0.011	1.41
39	2025	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.013	1.82	0.010	1.29
40	2026	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.012	1.62	0.008	1.15
41	2027	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.011	1.45	0.008	1.01
42	2028	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.010	1.29	0.007	0.90
43	2029	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.009	1.15	0.006	0.79
44	2030	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.008	1.03	0.005	0.70
45	2031	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.007	0.92	0.005	0.62
46	2032	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.006	0.82	0.004	0.55
47	2033	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.005	0.73	0.004	0.49
48	2034	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.005	0.66	0.003	0.43
49	2035	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.004	0.59	0.003	0.38
50	2036	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.004	0.52	0.003	0.34
51	2037	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.003	0.47	0.002	0.30
52	2038	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.003	0.42	0.002	0.26
53	2039	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.003	0.37	0.002	0.23
54	2040	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.002	0.33	0.002	0.21
55	2041	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.002	0.30	0.001	0.18
56	2042	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.002	0.26	0.001	0.16
57	2043	0.00	6.30	6.30	97.40	43.70	0.00	141.10	134.80	0.002	0.24	0.001	0.14
TOTAL		666.30	294.00	960.30	4036.70	2297.20	0.00	6333.90	5373.60		37.30		0.00

Total construction cost = US\$570.7 mil.

Replacement cost = US\$95.6 million

kwh value (domestic) = 0.056 US\$/kwh

kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%

Present value (B) = 348

Present value (C) = 310

B/C = 1.1

B-C = 38

IRR = 13.0%

Table 13-24 Sensitivity Analysis of FIRR

(402 MW: Power Export Decrease by 20 MW)

UNIT: MILLION US\$													
NO.	YEAR	INVESTMENT AND REPLACEMENT	COSTS OPERATION AND MAINTENANCE	TOTAL COSTS	SALABLE DOMESTIC	BENEFITS SALABLE EXPORT, SURPLUS	USEFUL CAPACITY	TOTAL BENEFITS	BENEFITS - COSTS	DISCOUNT FACTOR (12.00%)	NET PRESENT VALUE	DISCOUNT FACTOR (14.79%)	NET PRESENT VALUE
1	1987	4.80	0.00	4.80	0.00	0.00	0.00	0.00	-4.80	1.000	-4.80	1.000	-4.80
2	1988	19.60	0.00	19.60	0.00	0.00	0.00	0.00	-19.60	0.893	-17.50	0.871	-17.08
3	1989	20.60	0.00	20.60	0.00	0.00	0.00	0.00	-20.60	0.797	-16.42	0.759	-15.63
4	1990	22.70	0.00	22.70	0.00	0.00	0.00	0.00	-22.70	0.712	-16.16	0.661	-15.01
5	1991	48.00	0.00	48.00	0.00	0.00	0.00	0.00	-48.00	0.636	-30.50	0.576	-27.65
6	1992	74.60	0.00	74.60	0.00	0.00	0.00	0.00	-74.60	0.567	-42.33	0.502	-37.44
7	1993	116.00	0.00	116.00	0.00	0.00	0.00	0.00	-116.00	0.507	-58.77	0.437	-50.71
8	1994	62.30	1.90	64.20	5.10	0.00	0.00	5.10	-59.10	0.452	-26.73	0.381	-22.51
9	1995	12.10	1.90	14.00	9.40	0.00	0.00	9.40	-4.60	0.404	-1.86	0.332	-1.53
10	1996	20.00	1.90	21.90	13.70	0.00	0.00	13.70	-8.20	0.361	-2.96	0.289	-2.37
11	1997	69.90	1.90	71.80	18.30	0.00	0.00	18.30	-53.50	0.322	-17.23	0.252	-13.47
12	1998	42.90	1.90	44.80	23.10	0.00	0.00	23.10	-21.70	0.287	-6.24	0.219	-4.76
13	1999	5.20	5.70	10.90	28.00	118.10	0.00	146.10	135.20	0.257	34.70	0.191	25.84
14	2000	0.00	5.70	5.70	33.20	113.70	0.00	146.90	141.20	0.229	32.36	0.166	23.51
15	2001	0.00	5.70	5.70	38.60	109.10	0.00	147.70	142.00	0.205	29.06	0.145	20.60
16	2002	0.00	5.70	5.70	44.20	104.30	0.00	148.50	142.80	0.183	26.09	0.125	18.04
17	2003	0.00	5.70	5.70	50.00	99.30	0.00	149.30	143.60	0.163	23.42	0.110	15.81
18	2004	0.00	5.70	5.70	56.10	94.00	0.00	150.10	144.40	0.146	21.03	0.096	13.65
19	2005	0.00	5.70	5.70	62.40	88.70	0.00	151.10	145.40	0.130	18.91	0.084	12.15
20	2006	0.00	5.70	5.70	68.90	83.00	0.00	151.90	146.20	0.116	16.97	0.073	10.64
21	2007	0.00	5.70	5.70	75.70	77.20	0.00	152.90	147.20	0.104	15.26	0.063	9.33
22	2008	0.00	5.70	5.70	82.80	71.10	0.00	153.90	148.20	0.093	13.72	0.055	8.19
23	2009	0.00	5.70	5.70	90.20	64.70	0.00	154.90	149.20	0.083	12.33	0.048	7.18
24	2010	0.00	5.70	5.70	98.00	58.10	0.00	156.10	150.40	0.074	11.10	0.042	6.31
25	2011	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.066	9.97	0.037	5.53
26	2012	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.059	8.90	0.032	4.81
27	2013	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.053	7.95	0.028	4.19
28	2014	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.047	7.10	0.024	3.65
29	2015	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.042	6.33	0.021	3.18
30	2016	4.10	5.70	9.80	104.30	52.70	0.00	157.00	147.20	0.037	5.50	0.018	2.70
31	2017	13.90	5.70	19.60	104.30	52.70	0.00	157.00	137.40	0.033	4.59	0.016	2.19
32	2018	13.40	5.70	19.10	104.30	52.70	0.00	157.00	137.90	0.030	4.11	0.014	1.92
33	2019	9.30	5.70	15.00	104.30	52.70	0.00	157.00	142.00	0.027	3.78	0.012	1.72
34	2020	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.024	3.59	0.011	1.60
35	2021	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.021	3.21	0.009	1.39
36	2022	23.40	5.70	29.10	104.30	52.70	0.00	157.00	127.90	0.019	2.42	0.008	1.02
37	2023	18.90	5.70	24.60	104.30	52.70	0.00	157.00	132.40	0.017	2.24	0.007	0.92
38	2024	4.00	5.70	9.70	104.30	52.70	0.00	157.00	147.30	0.015	2.22	0.006	0.90
39	2025	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.013	2.04	0.005	0.80
40	2026	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.012	1.82	0.005	0.70
41	2027	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.011	1.63	0.004	0.61
42	2028	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.010	1.45	0.004	0.53
43	2029	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.009	1.30	0.003	0.46
44	2030	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.008	1.16	0.003	0.40
45	2031	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.007	1.03	0.002	0.35
46	2032	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.006	0.92	0.002	0.31
47	2033	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.005	0.82	0.002	0.27
48	2034	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.005	0.74	0.002	0.23
49	2035	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.004	0.66	0.001	0.20
50	2036	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.004	0.59	0.001	0.18
51	2037	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.003	0.52	0.001	0.15
52	2038	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.003	0.47	0.001	0.13
53	2039	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.003	0.42	0.001	0.12
54	2040	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.002	0.37	0.001	0.10
55	2041	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.002	0.33	0.001	0.09
56	2042	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.002	0.30	0.001	0.08
57	2043	0.00	5.70	5.70	104.30	52.70	0.00	157.00	151.30	0.002	0.27	0.000	0.07
TOTAL		605.70	266.00	871.70	4239.60	2820.40	0.00	7060.00	6188.30		102.19		-0.00

Total construction cost = US\$518.7 mil.
 Replacement cost = US\$87.0 million

kwh value (domestic) = 0.056 US\$/kwh
 kwh value (export) = 0.048 US\$/kwh

Discount rate = 12%
 Present value (B) = 384
 Present value (C) = 282
 B/C = 1.4
 B-C = 102
 IRR = 14.8%

[The page contains extremely faint and illegible text, likely due to low contrast or scanning quality. The text is arranged in several paragraphs, but the characters are too light to be transcribed accurately.]

JICA