

PROJECT COMPLETION REPORT

ON THE

KALI GANDAK I "A" HYDROELECTRIC PROJECT
(Loan 1452-NEP[SF])

IN

NEPAL

April 2004

CURRENCY EQUIVALENTS

(as of 15 March 2004)

Currency Unit – Nepalese rupee/s (NRs/NRs)

		At Appraisal (March 1996)	At Project Completion (March 2004)
NRs1.00	=	\$0.0179	\$0.0137
\$1.00	=	NRs 56.00	NRs73.00

ABBREVIATIONS

ADB	–	Asian Development Bank
C1	–	dam and desanding basin civil works contract
C2	–	headrace tunnel civil works contract
C3	–	power station civil works contract
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
ESSD	–	environment and social studies department
FIRR	–	financial internal rate of return
FY	–	fiscal year
JBIC	–	Japan Bank for International Cooperation
KGEMU	–	Kali Gandaki Environmental Management Unit
NEA	–	Nepal Electricity Authority
NGO	–	nongovernment organization
OECF	–	Overseas Economic Cooperation Fund
O&M	–	operation and maintenance
PAF	–	project-affected family
PCR	–	project completion review
ROR	–	rate of return
SEIA	–	summary environmental and technical aspects
SFR	–	self-financing ratio
SPAF	–	seriously project-affected family
TA	–	technical assistance
WACC	–	weighted average cost of capital

This report was prepared by Chong Chi Nai.

WEIGHTS AND MEASURES

m ³ /sec	(cubic meter per second)	–	unit of flow rate
GWh	(gigawatt-hours)	–	1,000 megawatt-hours
km	(kilometer)	–	1,000 meters
kV	(kilovolt)	–	1,000 volts
kVA	(kilovolt-amperes)	–	1,000 volt-amperes
kW	(kilowatt)	–	1,000 watts
kWh	(kilowatt-hour)	–	1,000 watt-hours
MW	(megawatt)	–	1,000 kilowatts
MWh	(megawatt-hour)	–	1,000 kilowatt-hours
W	(watt)	–	unit of effective electric power

NOTES

- (i) The fiscal year of the Government and Nepal Electricity Authority ends on 15 July. "FY" before a calendar year denotes the year in which the fiscal year ends, e.g. FY2003 ends on 15 July 2003.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

A. Loan Identification

1.	Country	Nepal
2.	Loan Number	1452-NEP(SF)
3.	Project Title	Kali Gandaki "A" Hydroelectric Project
4.	Borrower	Kingdom of Nepal
5.	Executing Agency	Nepal Electricity Authority
6.	Amount of Loan	SDR110.94 million (US\$160 million equivalent)
7.	Project Completion Report Number	PCR:NEP 807

B. Loan Data

1.	Appraisal	
	– Date Started	21 March 1996
	– Date Completed	1 April 1996
2.	Loan Negotiations	
	– Date Started	10 June 1996
	– Date Completed	13 June 1996
3.	Date of Board Approval	23 July 1996
4.	Date of Loan Agreement	27 August 1996
5.	Date of Loan Effectiveness	
	– In Loan Agreement	25 November 1996
	– Actual	12 December 1996
	– Number of Extensions	1
6.	Closing Date	
	– In Loan Agreement	15 July 2001
	– Actual	31 December 2003
	– Number of Extensions	2
7.	Terms of Loan	
	– Service Charge	1% per annum
	– Maturity	40 years
	– Grace Period	10 years
8.	Terms of Relending (if any)	
	– Interest Rate	10.25% per annum
	– Maturity	25 years
	– Grace Period	5 years
	– Second-Step Borrower	Nepal Electricity Authority

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
27 February 1997	23 December 2003	83 months
Effective Date	Original Closing Date	Time Interval
12 December 1996	15 July 2001	55 months

b. Amount (\$ million)

Category or Subloan	Original Allocation	Last Revised Allocation	Net Amount Available	Amount Disbursed	Undisbursed Balance
01	113.10	102.71	102.71	116.99	(14.27)
02	1.65	1.53	1.53	1.27	0.26
03	18.12	19.87	19.87	19.59	0.28
04	3.13	2.82	2.82	2.82	0
05	25.71	21.24	21.24	0	21.24
Total	161.71	148.17	148.17	140.67	7.50

Source: ADB

^a 01 – Civil Works (Lots 1 &3); 02 – Equipment (Loss Reduction); 03 – Consulting Services; 04 – Service Charge; 05 – Unallocated

^b The difference between the original amount as against the revised total amount was due to the exchange rate variation between the SDR and US\$.

10. Local Costs (Financed)

- Amount (\$)

0

C. Project Data

1. Project Cost (\$ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	320.0	241.3
Local Currency Cost	132.8	113.5
Total	452.8	354.8

2. Financing Plan (\$ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower-Financed	83.80	36.30
ADB-Financed	156.05	137.90
JBIC	156.05	98.90
Total	395.90	273.10
IDC Costs		
Borrower-Financed	49.00	77.20
ADB-Financed	3.95	2.80
JBIC	3.95	1.70
Total	56.90	81.70

ADB = Asian Development Bank, IDC = interest and service charges during construction, JBIC = Japan Bank for International Cooperation

Source: ADB and Nepal Electricity Authority

3. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate			Actual		
	Foreign	Local	Total	Foreign	Local	Total
Preliminary Works		4.7	4.7			
Civil Works						
Lot C1 (Dam and Desanders) - ADB	75.7	12.6	88.3	76.0	4.5	80.5
Lot C2 (Headrace Tunnel) - JBIC	54.6	6.4	61.0	40.2	2.7	42.9
Lot C3 (Powerhouse) - ADB	36.2	11.6	47.8	40.9	3.3	44.2
Electromechanical Equipment						
Lot 4 (Hydraulic Steel Work) - JBIC	21.6	0.9	22.5	18.5	0.5	19.0
Lot 5 (Electrical Equipment) - JBIC	31.1	1.0	32.1	18.3	1.6	19.9
Lot 6 (Mechanical Equipment) - JBIC	19.5	0.8	20.3	10.0	0.2	10.2
Lot 7 (Transmission System) - JBIC	10.5	2.9	13.4	11.9	1.1	13.0
Other Project Costs						
Construction Engineering - ADB	13.0	2.1	15.1	18.3	2.7	21.0
project management - ADB	2.1	6.1	8.2	1.0	4.9	6.2
Environmental Mitigation - ADB	2.3	3.0	5.3	0.0	3.8	3.8
Loss-reduction component - ADB	2.3	0.9	3.2	1.7	0.0	1.7
Taxes and Customs Duties	–	18.3	18.3	–	11.0	11.0
Contingencies	43.2	12.5	55.7	–	–	–
IDC	7.9	49.0	56.9	4.5	77.2	81.7
Total	320.0	132.8	452.8	241.3	113.5	354.8

Source: ADB and Nepal Electricity Authority

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	January 1997	January 1997
Civil Works Contract		
Date of Award	November 1996	December 1996
Completion of Work	November 2000	May 2002
Date of Equipment and Supplies Procurement		
First Procurement	September 1997	March 1998
Last Procurement	December 1998	July 2000
Start of Operations		
Completion of Tests and Commissioning	November 2000	May 2002

Source: ADB and Nepal Electricity Authority

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 1 Jan 1997 to 31 Dec 1997	Satisfactory	Satisfactory
From 1 Jan 1998 to 31 Dec 1998	Satisfactory	Satisfactory
From 1 Jan 1999 to 31 Dec 1999	Satisfactory	Satisfactory
From 1 Jan 2000 to 31 Dec 2000	Satisfactory	Satisfactory
From 1 Jan 2001 to 31 Dec 2001	Satisfactory	Satisfactory
From 1 Jan 2002 to 31 Dec 2002	Satisfactory	Satisfactory
From 1 Jan 2003 to 31 Dec 2003	Satisfactory	Satisfactory

Source: ADB.

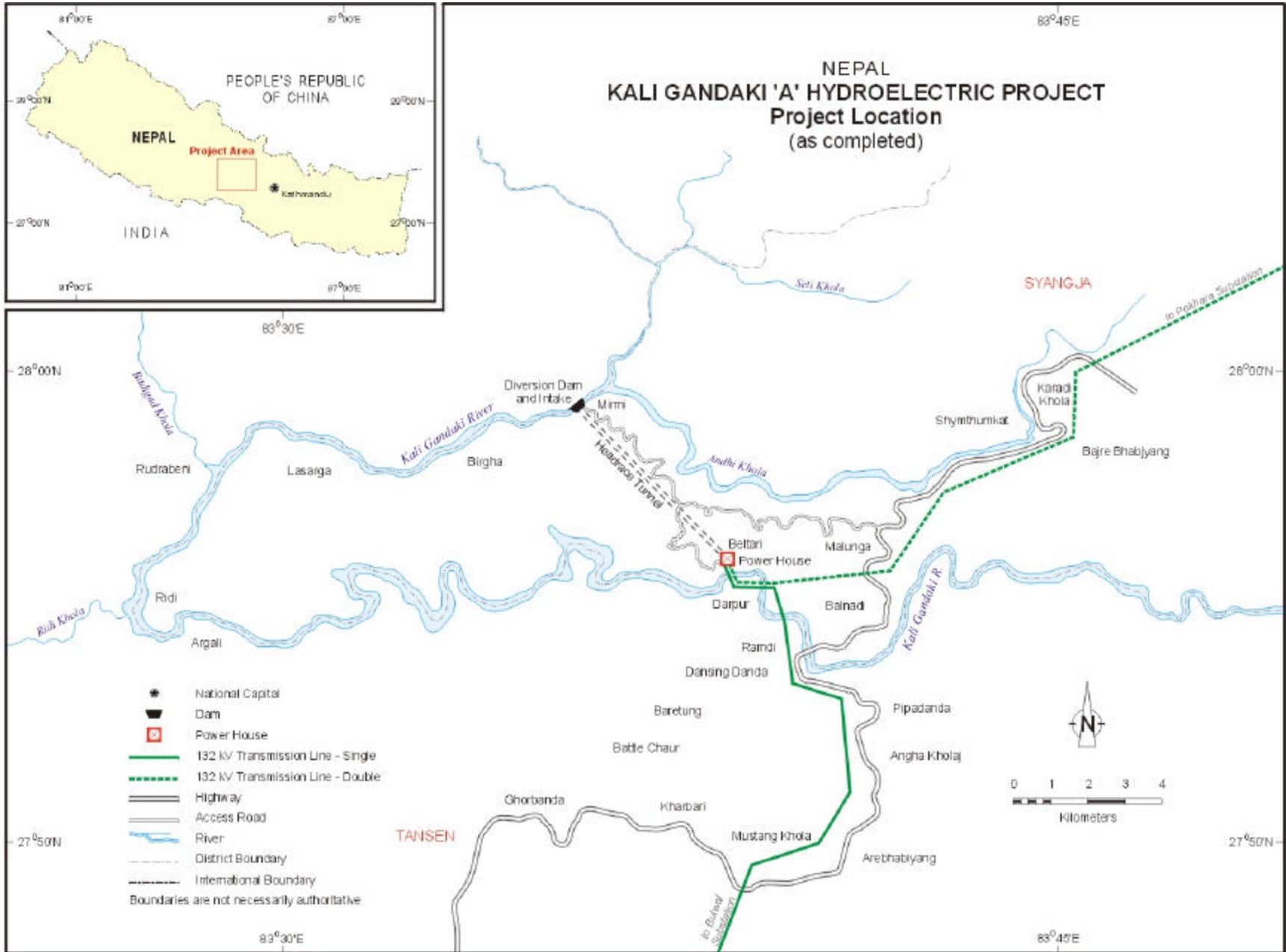
D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members ^a
Fact Finding	22 Jan–9 Feb 1996	9	162	a, c, d, f, g, g, h, e
Appraisal	21 Mar–1 Apr 1996	7	77	a, b, c, e, f, g, h
Inception	30 Jun–11 Jul 1997	4	48	a, a, c, d
Review	3–9 Dec 1997	1	7	a
Review	24 Feb–15 Mar 1998	2	20	a, i
Review	17–28 Mar 1999	3	36	a, f, i
Review	3–13 Sep 1999	1	10	a
SLA	6–20 Sep 2000	4	60	a, d, f, i
Review	14 Nov–4 Dec 2000	1	21	a
Review	23 Apr–10 May 2001	1	18	a
Review	16–25 Nov 2001	2	20	a, i
Review	17–19 Jan 2002	1	3	g
Review	24–28 Feb 2002	1	4	a
Review	2–11 Oct 2002	1	10	a
SLA	9–24 Sep 2003	6	58	a, c, g, h, i, j
PCR Mission ^b	13–28 Jan 2004	3	45	a, h, h

PCR = project completion review, SLA = special loan administration.

^a a – engineer, b – counsel, c – economist, d – procurement specialist/consultant, e – programs officer – f – financial analyst, g – social development specialist, h – resident mission officer – i – project analyst, j – environmental specialist.

^b The mission consisted of Chong Chi Nai, senior energy specialist and mission leader, South Asia Energy Division; Peter Logan, project administration unit head, Nepal Resident Mission; and Krishna Panday, senior project implementation officer, Nepal Resident Mission.



I. PROJECT DESCRIPTION

1. Hydroelectric power provides most of the electricity in Nepal. The Government's energy policy has focused on developing the country's large, economically exploitable hydropower potential as a renewable source of energy for domestic use and for exports. In line with this thrust, the primary objective of the Kali Gandaki "A" Hydroelectric Project (the Project) was to help meet the increasing demand for electricity in Nepal in an environmentally sustainable, socially acceptable, and least-cost manner. The Project's other objectives included improving the operational and financial performance of the Nepal Electricity Authority (NEA), the Executing Agency (EA), through attached technical assistance (TA) and a non-technical loss-reduction component, and improving NEA's cost recovery through enhanced retail tariffs that promote efficiency in power consumption.

2. The Kali Gandaki River flows in a U-loop for more than 45 kilometers (km) across a 6 km wide swath of land from Mirmi to Beltari in central Nepal. The elevation from Mirmi to Beltari drops about 108 meters (m), which the Project utilizes to generate electricity. A dam was constructed at Mirmi, just after the confluence of the Andhi Khola and Kali Gandaki rivers, to divert some of the water into a tunnel. The tunnel conveys the water to a 144-megawatt (MW) surface power station in Beltari. The Project has sufficient storage behind the diversion dam to operate at full capacity for six hours a day, even during the dry season.

3. The Project, envisaged at appraisal, comprised the following key components: (i) a 44-m high concrete gravity diversion dam and gated spillway, and an adjacent intake and desanding basin; (ii) a 5.9-km long concrete-lined headrace tunnel with a diameter of 7.4 m; (iii) a surge shaft, pressure shaft, tunnel leading to the power station and the power station; (iv) hydraulic steelworks including the supply of gates for the spillway, desander, headrace tunnel and power station, as well as the steel liners for the pressure tunnel; (v) electrical and mechanical plant and auxiliaries for the three 48-MW turbo-generating units, transformers, and switchgear to be installed at the power station; and (vi) two 132-kilovolt (kV) transmission lines, one to Pokhara (61.4 km) and the other to Butwal (44.3 km).

4. The Project also included two attached TA grants. The objective of the first TA, Institutional Strengthening of NEA's Environment Division, was to build NEA's capacity to ensure that environmental and social issues were addressed adequately in the design, construction, operation, and monitoring of power development projects in Nepal. The second TA, Power System Master Plan, was to prepare a new power system master plan for Nepal, with emphasis on generation planning, and also to provide on-the-job training to NEA staff.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

5. Hydropower accounts for about 86% of the generation capacity in the country. In 1992, the Government adopted the Hydropower Development Policy, which aimed to develop Nepal's large hydropower potential in an environmentally sustainable manner for (i) meeting the country's energy needs, and (ii) exporting electrical energy to generate revenues.

6. The Asian Development Bank's (ADB's) operational strategy for Nepal focuses on reducing poverty by (i) promoting broad-based, labor-absorbing economic growth that is sustainable and environmentally sensitive; (ii) enhancing the policy environment to promote

greater private sector participation in development; (iii) augmenting basic social services; and (iv) protecting the environment. The power shortage significantly constrains the Government's efforts to promote economic growth and generate adequate employment opportunities. Thus, a key element of ADB's strategy is to help Nepal develop its power sector, which is in line with the Government's emphasis on power sector development. ADB's strategic objective is to assist Nepal in developing its abundant water resources in an efficient and cost-effective manner.

7. The rationale for the Project was the need to meet the growing power demand in Nepal in a least cost manner. This was to be done by harnessing water resources to generate renewable energy with minimal environmental and social impacts. The Project was specially designed to minimize load shedding by building in year-round peaking capability to meet daily peak load requirements. The Project complemented the non-peaking, run-of-river 60 MW Khimti Hydropower Plant and 36 MW Bhote Khosi Hydropower Plant developed by two independent power producers.

8. NEA identified the Project as an integral component of its least-cost generation expansion plan, and a prime candidate for hydropower development of the Kali Gandaki River. The first feasibility study, which was completed in 1979, was updated in 1992 with assistance from the United Nations Development Program. NEA then proceeded with detailed engineering and the preparation of tender documents with ADB assistance for consulting services.¹

B. Project Outputs

9. The main project outputs were:

- (i) Main civil works, comprising (a) a 44-m high concrete gravity diversion weir with gated spillway, intake and desanding basin (Lot C1); (b) a 5.9 km long headrace tunnel with 7.4 m diameter (Lot C2); and (c) surge and pressure shafts, including steel liners,² a tunnel leading to the power station, and the power station (Lot C3);
- (ii) Hydraulic steelworks—comprising gates for the spillway, desander, headrace tunnel, and power station—and steel liners for the intake undersluices (Lot 4);
- (iii) Electrical (Lot 5) and mechanical (Lot 6) plant and auxiliaries for the three 48-MW turbo-generating units, transformers, and switchgear; and
- (iv) Two 132 (kV) transmission lines (Lot 7)—one to Pokhara (65.5 km)³ and the other to Butwal (39.1 km)—and a substation at Pokhara.

10. The components were installed and commissioned as envisaged at appraisal. The first 48 MW generating unit was commissioned on 31 March 2002, the second unit on 19 April 2002, and the third unit on 24 May 2002.⁴ The 132 kV transmission line from the power plant to Butwal was commissioned on 24 February 2002, while the transmission line to Pokhara, which was delayed due to land access problems, was commissioned on 16 August 2002.

¹ ADB. 1983. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the Kingdom of Nepal for the Fifth Power Project*. Manila. (Loan No. 670-NEP[SF], for \$20 million, approved on 14 December 1983). Savings from this loan, along with cofinancing from the United Nations Development Program and the Department for International Development Cooperation of Finland, were used to finance the consulting services.

² These steel liners originally were included under Lot 4.

³ Originally, the line was 61.4 km, with the transmission line connecting to an existing substation at Pokhara. To avoid houses being located under the line, a new substation near Pokhara was proposed, requiring a slight extension of the original transmission line.

⁴ The Take-Over Certificates issued by the consultant engineer were issued on 19 May 2002 for Lot C1, 3 March 2002 for Lot C2, and 28 February 2002 for Lot C3.

11. A change in the scope of the Project was necessary. The Project operates in a river that carries excessive amounts of sediment, which required the establishment of a large desanding basin to remove most of the sediment before the water passes through the turbines. To create space for the desander basin, the slope on the left flank of the valley had to be steepened. Due to difficult geological conditions, some of which became known only as the steepened slope was being cut, the slope became unstable and its backslope had to be cut back twice thus involving substantial earth excavation. In addition, geological conditions that could not have been readily foreseen caused a major collapse at the surge tank during excavation of the shaft. Similarly, geological conditions during excavation of the headrace tunnel were very difficult at times, resulting in more major delays. Because of the change in the slope behind the desander basin, and various other delays in project implementation, the consulting services of the Project had to be increased accordingly. The rerouting and extension of the transmission line to Pokhara to avoid houses being located under the line caused another change in the scope of the Project.

12. The ADB loan also financed (i) construction engineering services, (ii) project management services (including panels of international experts for safety and technical aspects as well as environmental and social advisory aspects), (iii) a Kali Gandaki Environmental Management Unit (KGEMU), and (iv) a loss-reduction component.⁵

C. Project Costs

13. The estimated project cost at appraisal was \$452.8 million, of which \$320.0 million (or about 71%) was in foreign exchange, including \$7.9 million for service charges and interest during construction; and \$132.8 million (or about 29%) was in local currency costs, including duties and taxes. ADB provided a loan of \$160.0 million equivalent from its Special Funds resources to finance 50% of the foreign exchange cost, including service charges during construction. The Japan Bank for International Cooperation (JBIC)⁶ provided a loan of \$160.0 million equivalent to cover the balance of the foreign exchange requirement. ADB and JBIC financing totaled \$320.0 million or 71% of the project cost. The Government and NEA, through internally generated sources, funded the remaining cost of \$132.8 million equivalent. The ADB loan financed the civil works packages Lot C1 and Lot C3, construction engineering, project management, environmental mitigation, and the loss-reduction component. The cost of each ADB-financed contract is shown in Appendix 1.

14. The Project Completion Review (PCR) Mission estimated the completion cost of the project to be \$354.8 million, with a foreign exchange cost of \$241.3 million (or about 68% of the total) and a local currency cost of \$113.5 million (or 32%). ADB funded \$140.7 million, or 40%, of the project costs; JBIC funded \$100.6 million, or 28%; and the Government funded \$113.5 million, or 32%. The appraisal estimate included physical contingencies and provisions for price escalation on the foreign exchange and on the local currency costs. It also included an estimate of the interest and service charges during construction. The actual cost of ADB-financed contracts included \$2.8 million for service charges. A comparison of the actual cost of the Project with the appraisal estimates is shown in the Basic Data section.

⁵ The consultants were appointed on 27 February 1998 and began work in March 1998. The final report was submitted in March 1999 with an Action Plan. The loss-reduction program has not cut losses significantly, even though all of the equipment under the program was installed. The reasons given were (i) high levels of electricity theft, (ii) the lack of special policy incentives prevented the formation of user groups, and (iii) the Plan was not implemented.

⁶ Japan Bank for International Cooperation was formerly known as The Overseas Economic Cooperation Fund, Japan (OECF).

15. As agreed under the financing plan at appraisal, proceeds of the ADB loan were lent to NEA at an interest rate of 10.25% per year, repayable over 25 years, including a grace period of 5 years. The Government carried the foreign exchange risk.

D. Disbursements

16. The projected and actual disbursements under the loans are compared in Appendix 2. On 23 September 1997 ADB approved NEA's request that the Loan Agreement be amended to increase ADB financing of the foreign currency portion of the loan for civil works from 82% to 89%. Disbursement of the loan proceeds was slower than expected due to delays in project implementation caused by several factors. Delays in the mobilization of the civil works contractors caused further slippage.

E. Project Schedule

17. The chronology of major events in project implementation is shown in Appendix 3, while the planned and executed implementation schedules are in Appendix 4. At appraisal, the Project was estimated to take 4.5 years, with completion expected by 15 January 2001. The Board of Directors of ADB approved the loan on 23 July 1996 and the Loan Agreement was signed on 27 August 1996. The Loan became effective on 12 December 1996. The loan closing date was extended twice from the original closing date of 15 July 2001—first to 15 July 2003 and then to 31 December 2003—due to implementation delays.

18. The construction program for the Project was designed to accommodate the high monsoon river flows during the wet season (June to September) and the low flows during the dry season (October to May). Due to the seasonal nature of the river flows, the timing of some activities for Lot C1 was critical. These included (i) the completion of the excavation of the desander basin to ensure temporary diversion of the river flow by November 1998; and (ii) the excavation of the diversion weir foundation and concreting in the riverbed before the onset of the high river flows in 1999. Excavation should have started in May 1997. However, due to the late mobilization of the civil works contractor, excavation started in August 1997.

19. The Project's delays were technical and non-technical. The technical delays, most of which were unforeseeable, were mostly attributable to (i) the desander basin backslope redesign, (ii) the second diversion of the river through the desander, (iii) the adverse rock conditions in the headrace tunnel, and (iv) the geotechnical rock conditions at the surge tank. These delays are described in detail in Appendix 5.

20. The relationships involving NEA, the project implementation consultant, and the civil works contractor caused the non-technical delays. Each one blamed the others for delaying implementation. As a result, the decision-making capability of the Project was impaired, delaying the timely implementation of the Project. The power plant was physically completed in May 2002. That was 16 months later than the physical completion target at appraisal of 15 January 2001. Commercial operation began in August 2002.

F. Implementation Arrangements

21. The implementing arrangements were carried out as envisaged at appraisal. NEA was the EA for the Project. The managing director of NEA was to be responsible to NEA's Board for

project management. As required under the Loan Agreement,⁷ NEA established a project director with responsibility for the day-to-day operation of the Project under a clearly defined level of delegated authority. NEA also appointed two panels of international experts for the construction phase—one for safety and technical aspects, and the other for environmental and social aspects of the Project. NEA also established the KGEMU for environmental and social monitoring of the Project. The consultant who handled the design and engineering of the Project continued to assist NEA with project implementation under ADB financing. An organization chart of the NEA is in Appendix 6.

22. Although the implementation arrangements were as envisaged at appraisal, the management of the Project under those implementation arrangements encountered several delays. The setting up of the KGEMU also was delayed (paras. 26 and 43).

G. Conditions and Covenants

23. Compliance with the covenants under the loan is presented in Appendix 7. The Borrower and NEA fully complied with about 32% of the loan covenants, 25% were complied late, 29% were partially complied with, and 14% were not complied with. Poor compliance with loan covenants was mainly in the financial and economic-efficiency areas.

24. Covenants requiring NEA to (i) reduce its system loss⁸ to 20% or below, (ii) adjust tariffs to enable a self-financing ratio of 23% (the tariff structure of NEA is shown in Appendix 8), (iii) maintain a debt service coverage ratio of not less than 1.2, and (iv) keep accounts receivables within 3 months of energy sales, were not complied with. System losses were reduced, though not to the level targeted in the Loan Agreement.

25. Under the Project Agreement, NEA also was obliged to furnish ADB with certified copies of audited financial statements for its annual operations within 9 months of the close of each fiscal year. For FY1999, audited financial statements were due by 16 April 2000. Preliminary audited statements were received by ADB. However, final audited financial statements were overdue. The audited financial statements for FY2002, which were due in April 2003, were received in February 2004. The audited financial statements of previous financial years were also overdue. Thus, this covenant was not complied with. Financial statements for NEA have been obtained to examine the performance of NEA in recent years. A balance sheet, an income statement, and a source and application of NEA funds for FY1995–FY2002 were obtained. NEA also provided forecasts of these financial statements up to FY2007. These financial statements are shown in Appendix 9.

26. For environmental covenants, the Loan Agreement required NEA to establish the KGEMU, and appoint the agreed upon staff, within 3 months of the effective date. That means NEA should have established the KGEMU by 12 March 1997. NEA did not comply. After long delays, NEA agreed with an ADB Mission in October 1997 to fully staff KGEMU by mid-November 1997. This also did not occur. A recommended deadline of March 1998 was given, which was subsequently extended. After an ADB letter of 19 June 1998, NEA informed ADB by letter dated 30 June 1998 of its intention to fully comply. The Environmental and Social Studies Department (ESSD) of NEA conducted a post-construction environmental audit, and the final report was received by ADB on 26 February 2004.

⁷ Loan Agreement, Schedule 6, paras. 1, 2, and 3.

⁸ System loss is expressed as a percentage of the difference between gross energy generated and energy sold to the gross energy generated.

H. Related Technical Assistance

27. ADB included two TA grants for the Project: (i) Institutional Strengthening of NEA's Environmental Division (TA 2613-NEP),⁹ and (ii) Power System Master Plan for Nepal (TA 2614-NEP).¹⁰

28. The consultants¹¹ engaged for TA 2613-NEP began work in May 1997, and completed the study in August 1999.¹² The objective of the TA was to build NEA's capacity to ensure that environmental and social issues were addressed adequately in the design, construction, operation, and monitoring of power development projects in Nepal. Specifically, the TA was to assist NEA in (i) formulating an environmental and social management framework, with special emphasis on environmental guidelines, social assessment, and public participation; (ii) identifying and participating in appropriate in-country and external staff training; (iii) developing an environmental management information system; and (iv) acquiring essential logistical support and reference documents. A TA completion report¹³ was completed in December 1999, and the TA was rated as partially successful. NEA staff rated the external training highly, and the in-house training programs were well-attended. However, counterpart staff outside of the training programs had limited input, which constrained the TA's impact on on-the-job training and capacity building.

29. The consultants¹⁴ engaged for TA 2614-NEP started work on 4 August 1997, and completed the study in August 1998. The objective of the TA was to (i) prepare a new master plan for the power system of Nepal, including a new load forecast, generation expansion plan, and transmission master plan; and (ii) conduct on-the-job training of NEA's engineering staff in power system planning.

30. One of the major tasks of the TA was to produce a generation expansion plan.¹⁵ The plan prepared by the consultants had a number of serious deficiencies, and required substantial revision. One of the most serious problems was the consultants' optimistic assessment of the prospect of selling surplus hydroelectric generation to India. However, numerous other problems also were identified. Most of the misunderstandings by the consultants were the result of inadequate communication between the consultants and NEA staff as well as other consultants working in Nepal on hydropower projects. Approximately 75% of the TA time was to have been spent in Nepal to ensure close interaction with NEA. The consultants, however, seemed unwilling to involve NEA staff in a meaningful way in carrying out the study, or in discussing assumptions and results with NEA. While the consultants needed a considerable amount of extra time for changes to the work they had undertaken, they eventually completed the final report to a satisfactory standard. The consultants absorbed much of the large cost overrun of approximately 30%. A contract variation was prepared to utilize all of the uncommitted funds. The TA was rated as partially satisfactory. The TA completion report is in Appendix 10.

⁹ ADB. 1996. *Technical Assistance to the Kingdom of Nepal for Institutional Strengthening of NEA's Environmental Division*. Manila.

¹⁰ ADB. 1996. *Technical Assistance to the Kingdom of Nepal for Power System Master Plan for Nepal*. Manila.

¹¹ The contract was signed in April 1997.

¹² The TA was due to be completed in March 1998 but the Final Report was delayed due to a long unscheduled hiatus by the Team Leader, and to accommodate scheduling of training activities, and final adjustment of eligible costs.

¹³ ADB. 1999. *Technical Assistance to the Kingdom of Nepal for Completion Report on Institutional Strengthening of NEA's Environment Division*. Manila.

¹⁴ The contract was signed on 10 April 1997.

¹⁵ The other two tasks were to produce (i) a load forecast report, and (ii) a transmission master plan.

I. Consultant Recruitment and Procurement

1. Consultant Recruitment

31. The project implementation consultant was recruited in accordance with ADB's *Guidelines on the Use of Consultants*. NEA negotiated a contract with the design-phase consultant for the construction phase of the Project. The contract for construction supervision was signed on 15 January 1997.

32. As a result of the delays in the civil works and the consequent delays in the mechanical and electrical installations, the construction supervision work was extended beyond the original dates foreseen in the contract. On 22 December 2000, the Ministry of Finance informed ADB that, due to time overruns and the additional scope of work assigned to the consultant, the budgetary allocation for consulting services (Category 3) was insufficient. The Ministry of Finance requested that ADB reallocate \$3.17 million from loan Category 5 (unallocated) to loan Category 3. ADB approved this request. The consultant's expatriate person-months required to complete the project increased from 558 to 735.

2. Procurement

33. Procurement financed by ADB was undertaken in accordance with ADB's *Guidelines for Procurement*, while procurement financed by JBIC followed JBIC's procurement guidelines. Some local competitive bidding was used for the preliminary works and for a small, but critical, part of the excavation of the access road at the dam site, which was carried out before the awarding of international contracts. The remaining procurement was undertaken through international competitive bidding. The contract packages were divided between ADB and JBIC to facilitate parallel financing in accordance with procurement requirements. Advance procurement action was approved based on the need to deliver power to consumers as soon as possible. In addition, a clearer picture could be presented to the ADB Board of Directors on the project cost once bids were opened in June 1996. The loan was processed relatively quickly due to the fact that ADB had been working on the Project since 1992, had fielded several missions during the project preparatory stage, and had been closely involved in the development of the Project at every stage. ADB told the Government that the tight schedule between opening bids in the middle of 1996 and the targeted commencement of civil works in December 1996 required cutting the normal processing time in half.

34. The project implementation consultant prepared the prequalification and tender documents for the civil works packages (C1, for the dam and desanding facilities; C2, for the headrace tunnel; and C3, for the power station). ADB financed C1 and C3, while JBIC financed C2. In response to the August 1994 invitation for prequalification, 36 firms submitted applications. Of those firms, 13 satisfied the prequalification criteria.¹⁶ Twelve of prequalified firms purchased tender documents issued on 31 March 1996. Nine bids were received by the closing date of 14 July 1996, and seven of them covered all three lots. Impregilo S.p.A.¹⁷ of Italy (Impregilo) provided the lowest bid, with a read out price of \$123 million for the three lots.¹⁸

¹⁶ ADB approved prequalification of the 13 civil contractors on 19 June 1995.

¹⁷ Originally the Joint Venture (JV) of COGEFAR-SPIE was one of the prequalified contractors. On 3 April 1996, NEA was advised of the merger of COGEFAR into Impregilo. On 17 May NEA was advised that SPIE had withdrawn from the JV and that Impregilo would submit the bids for the main civil works. The Procurement Committee approved NEA's request to qualify Impregilo as a contractor in place of the originally qualified COGEFAR-SPIE.

¹⁸ This bid was about 37% lower than the appraisal estimate of \$197 million provided by the design stage consultants.

However, all the bids received showed a longer construction schedule (2–9 months more) than required in the tender documents. The consultant and NEA evaluated the bids in accordance with the criteria in the tender documents and ADB's *Guidelines for Procurement*.

35. On 23 September 1996, NEA requested that ADB concur with its decision to award the contract for the civil works to Impregilo. ADB approved the request on 4 October 1996. NEA and Impregilo negotiated from 4 November to 30 November 1996. Impregilo's quoted price for Lot C1 had to be increased by approximately \$6.5 million equivalent, as their original quoted price was based on receipt of a letter of acceptance from NEA on 1 November 1996. As this date proved unrealistic, Impregilo established a new date of 15 December 1996. Impregilo pointed out that this 6-week delay, which cut significantly into the dryflow season, could delay project completion. NEA asked Impregilo to accelerate the schedule to achieve the original start date of 1 July 2000 for testing the first unit. Impregilo indicated that meeting the original date would require additional earthmoving equipment, concreting equipment, and personnel. NEA and Impregilo agreed on a net cost increase for Lot C1 of NRs371,050,250 (\$6.5 million equivalent). The contract was awarded on 12 January 1997.

J. Performance of Consultants, Contractors, and Suppliers

1. Consultant

36. The project implementation consultant made many staff changes. NEA was not happy with the staff changes, but had to endorse them to keep the project implementation moving forward. The relationship between the consultant and NEA was not good. The consultant indicated to ADB on 31 August 2000 that it would cease operations at the site if its claims, which totaled around \$1.1 million, were not settled immediately by NEA.¹⁹

37. The consultant's reports were sometimes as much as 4 months late, and were not necessarily in the format requested by ADB. The majority of the problems, however, stemmed from NEA not deciding on the submitted documents within the period stipulated in the contract. That forced the consultant to issue variation orders, even if there was no formal approval from NEA. Otherwise, the implementation progress of the Project would have been slowed, and the consultant might have been held responsible. A timely, structured response from NEA would have preempted most of these issues. However, NEA would like it to be noted that the consultant, at several occasions, took a long time to furnish details on queries raised by NEA concerning requests for contract variations submitted by the contractor. Due to difficulties in the performance of the consultant—wrongly reporting to ADB claims of nonpayment by NEA for follow-up actions, frequent changes in personnel, delayed reporting not adequately highlighting ADB's requirements etc.—the technical performance of the consultant is considered less than satisfactory.

¹⁹ Of the \$1.1 million, \$277,000 had already been approved by NEA, and \$376,679 covering payments up to July 2000 was approved in September 2000. This left about \$450,000 still to be negotiated and approved. Payment was made in October 2000.

2. Contractors

38. The performance of the civil works contractor for Lots C1, C2, and C3 of the Project was satisfactory. The majority of the delays that occurred in implementation of the Project was not caused directly by the contractor.²⁰

39. On 23 August 2000, the contractor notified ADB and JBIC that it would (i) reduce gradually all its resources, and (ii) eventually serve a termination notice under clause 69.1 of the contract. This had become necessary due to the failure of NEA to honor its contractual obligations and pay the contractor for \$4.8 million of works executed and duly certified by the project implementation consultant under Lots C1 and C3. At this stage, the Project was approximately 65% complete and 17 months behind schedule. ADB undertook a Special Loan Administration Mission in September 2000 to resolve this situation. ADB accepted the variation authorization requests in lieu of the variation orders for withdrawal applications. On 8 September 2000, ADB paid about \$4.8 million outstanding to the contractor.

K. Performance of the Borrower and the Executing Agency

40. ADB had noted for some time important shortcomings in the Borrower's attention to technical, contractual, and management requirements of project implementation, and consequently decision-making in a timely manner. In the past, ADB had assisted NEA with the settlement of management issues.

41. On numerous occasions, NEA senior project staff were heavily engaged in matters that required their presence in Kathmandu. NEA management's attention to the Project, decision-making capability, and presence at the site were inadequate. The presence on the site of the NEA project director²¹ also was insufficient, and NEA indicated an inability to resolve these issues in a timely manner. A focus on day-to-day requirements of project implementation was lacking. The project director passed on major decisions to NEA's Board, resulting in further delays. A project director was relocated to the project site on a permanent basis on 10 October 2000.

42. NEA was not able to resolve contractual issues in a timely manner.²² ADB assisted in the establishment of action plans, and proposed in March 1999 the creation of a Dispute Review Board to assist in resolving matters between the concerned parties. The proposal was not pursued. When decisions were delayed by NEA, the contractor had to commit resources without assurance that it would be adequately compensated.

43. NEA's appointment and contract extension policy concerning KGEMU²³ consisted of periodic extensions of contracts up to 6 months, which were extended generally at the last

²⁰ Some delays, however, were due to the contractor. Work on contract C1 was commenced late due to a 3-month delay in the importation of construction equipment by the contractor. Similarly, C3 was running approximately 3 months late due to delays in the import of cement in January 1998.

²¹ There were five project directors during the implementation of the Project.

²² NEA often took more than 6 months to respond to correspondence from the consultant. The consultant reported that in 2000 alone, NEA had not replied to 42 letters requiring an answer. An example of NEA's lack of decision-making capability was its failure to extend the position of the consultant's chief geologist and headrace tunnel resident engineer in a timely manner. Consequently, this key individual resigned effective 15 February 2000 and obtained employment outside of Nepal.

²³ Schedule 6, para 3, of the Loan Agreement required NEA to establish, within 3 months of the Effective Date, the KGEMU and appoint agreed staff. Since the loan became effective 12 December 1996, the KGEMU should have been established by 12 March 1997. NEA did not comply. After long delays, NEA agreed with an ADB Mission in

moment. Despite numerous ADB interventions to change the hiring practice of KGEMU staff, NEA continued to (i) extend contracts of staff only for durations of up to 6 months (but generally less), (ii) leave affected staff uncertain if their contracts would be extended, and (iii) reach decisions on contract extensions at the last moment. ADB sent a letter dated 29 October 1999 to NEA on staffing issues. A follow-up letter was sent on 24 November 1999, but NEA continued with its KGEMU staff hiring practice.

44. The contractor requested a time extension for project completion on 14 October 1998. However, NEA took almost a year before issuing an interim determination to the contractor on 8 October 1999. NEA issued its final determination on 19 October 1999.

L. Performance of ADB

45. Overall, the performance of ADB was satisfactory. The Borrower and the EA appreciated the assistance and cooperation provided by ADB. During implementation, ADB closely monitored progress, fielded review missions, and provided valuable assistance in resolving conflicts with contractors and consultants. ADB undertook 1 inception mission, 10 review missions, and 2 special loan administration missions. These missions included visits to the project site and NEA's head office in Kathmandu, where all parties involved in the Project met to discuss and solve problems. The EA recognized the role ADB review missions played in providing advice on technical issues, preparation and evaluation of bid documents, and matters of loan administration.

III. EVALUATION OF PERFORMANCE

A. Relevance

46. The rationale of the Project—to ease the acute power supply shortage in the country through the addition of urgently needed power generating plants—was sound. The Project was in line with ADB's operational strategy at the time of appraisal. It supported the Government's least-cost development program to expand electricity generation, enhance the reliability of the power supply, and alleviate the power shortage. Through TA assistance, the Project also assisted in addressing important policy issues. The Project is rated highly relevant.

B. Efficacy in Achievement of Purpose

47. Although the Project encountered significant delays in implementation, mainly due to unforeseen adverse geological conditions, the project cost of about \$360 million²⁴ was still below the appraisal estimate of about \$450 million. It is the largest power plant in Nepal, harnessing water resources to generate renewable energy with minimal environmental and social impacts. More importantly, it can meet daily peak load requirements year-round with an output of 144 MW. The plant was designed to produce an annual average of 842 GWh of renewable energy, providing much-needed power to meet the country's electricity demand. It also reduced the country's dependence on expensive imported diesel fuels to run (i) NEA diesel

October 1997 to a fully staff KGEMU by mid-November 1997. This did not happen. A recommended deadline of March 1998 was given, and was subsequently extended. After an ADB letter of 19 June 1998, NEA informed ADB by letter dated 30 June 1998 of its intention to fully comply. On 19 August 1998, NEA informed ADB that it had appointed a KGEMU manager. Repeated requests by ADB and panel of experts to fully implement the KGEMU component were substantially ignored by NEA for more than 1 year.

²⁴ The resolution of contractual disputes between NEA and the civil works contractor are not expected to change the final project cost significantly.

generators during peak periods, and (ii) privately-owned diesel generators, which are inefficient and polluting, during load shedding. Without the Project, load shedding would have continued to hamper the economic development of Nepal. The Project, therefore, is considered successful in achieving its objective and is rated highly efficacious.

C. Efficiency in Achievement of Outputs and Purpose

48. The Project is considered efficient in the achievement of outputs and purpose, despite delays due mainly to unforeseen adverse geological conditions. The Project was the least-cost generation option to address the acute power supply shortage in Nepal by harnessing renewable indigenous hydropower resources. The main impact of the Project was the displacement of inefficient and polluting diesel generators used by industrial and commercial consumers, thereby reducing the reliance on expensive imported fuels. The Project also led rural consumers to switch from kerosene to electric lighting. The Project was implemented in an environmentally and socially accepted manner. In estimating the economic internal rate of return (EIRR) for this Project Completion Report, the Project was evaluated in a similar way to that at appraisal. Appendix 11 provides details on the methodology that was used, assumptions, and workings underlying the EIRR estimates. The reevaluated EIRR was 18.2%, which compares favorably with the opportunity cost of capital of 12%.

D. Preliminary Assessment of Sustainability

49. The project facilities were designed and constructed to international standards with quality civil works and electromechanical equipment. To address the high level of sedimentation in the Kali Gandaki River during the wet season, the hydropower plant was the first in Nepal with an innovative twin-channel desander basin that allows the Project to continue operation when one of the channels undergoes flushing every other day during the wet season. Since beginning operation in August 2002, the Project has produced about 920 GWh of electricity and earned NEA about NRs4.6 billion, thereby contributing to the financial strengthening of NEA. Under an experienced plant director, the Project has been operating well. Regular maintenance has been taking place as scheduled. In estimating the financial internal rate of return (FIRR), the Project was evaluated in a similar way to that at appraisal. Appendix 12 provides details on the methodology that was used, assumptions, and workings underlying the FIRR estimates. The estimated FIRR for the Project was 12.6%, well above the weighted average cost of capital (WACC) of 5.4%. That indicates the sustainability of the project in financial terms. With regular maintenance, the Project should last its economic life and meet its design, specification and capacity targets. Thus, the sustainability of the Project is rated as likely.

50. However, NEA's financial position remains problematic. For the Project to be maintained properly, NEA needs to improve its financial position to ensure that resources are available for proper and adequate maintenance. The Mission noted that the two most problematic areas in the financial position of NEA are the self-financing ratio and the rate of return. Accounts receivable, which reached the equivalent of 3.6 months in FY2003, are high. System losses at around 23.6% in FY2003 are also problematic. However, system losses have shown a slight improvement from FY2002, when they stood at 24.8%.

E. Environmental, Sociocultural, and Other Impacts

51. The Project was specially designed to minimize environmental and social impacts. Mitigation costs covered, among other things, compensating and relocating project-affected families (PAFs), measures for limiting the impacts on fish, and environmental and resettlement

monitoring during construction. Accordingly, NEA retained a two-member panel of international experts to review the environmental and social aspects, and make recommendations on specific issues identified during such reviews. NEA established its KGEMU to conduct environmental and resettlement monitoring of the Project during construction. NEA also engaged its ESSD to carry out a post-construction audit. However, NEA has yet to sign a contract with ESSD to monitor the environmental and social aspects during the operation of the Project.

52. Based on the September 2003 Special Loan Administration Mission's findings and discussions with stakeholders, the responsible parties agreed to implement a time-bound action plan. At the time of the PCR Mission, the three major environmental concerns that were not addressed satisfactorily were (i) the disposal of surplus construction materials and solid wastes, some of which could be considered hazardous or potentially hazardous; (ii) trapping and hauling of fish across the dam; and (iii) sustainable operation of the fish hatchery. NEA committed to address these outstanding issues to ensure that the Project continues to be environmentally and socially acceptable to all concerned.

53. Appendix 13 summarizes the findings on the environmental and sociocultural impacts of the Project from ESSD's April 2003 post-construction audit study, the September 2003 Special Loan Administration Mission, and the January 2003 PCR Mission. A small community of Bote people in Andhimuhan village—seven families by the Andhi Khola riverbank and 10 families on the Impregilo workshop site—have been seriously affected. Three Bote families had to relocate twice, once from the access road and later when they relocated for the Impregilo workshop. One Bote family lost land to the access road and reservoir. The post-construction audit study found that the Project "...has had mixed impact (both beneficial and adverse) on the traditional livelihoods and lifestyles of the Bote community..." The Bote people depend on traditional fishing, ferrying people across the river in small boats, and working as wage laborers for their livelihoods. They were adversely affected by the damming of the river, which reduced fish density, and the permanent infrastructure constructed for crossing the river. However, the Project also created new opportunities for boating on the reservoir up to Seti Beni holy site, involvement in fish culture, and long-term employment opportunities in the fish hatchery. NEA must continue to give the affected Bote families equal access to exploit these new opportunities. NEA built houses with electricity connections for the seven Bote families resettled from the Andhi Khola riverbank. NEA and Impregilo agreed to build houses for the 10 Bote families on the site previously used by Impregilo for its workshop. Impregilo completed its four houses in January 2004 while the remaining six houses, financed by NEA, are expected to be completed by June 2004.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

54. The Project is considered successful, based on a review of its relevance, efficacy, efficiency, sustainability, and impact on institutional development. The Project would have been rated as highly successful if more attention was given to addressing environmental and social concerns. Appendix 14 includes a quantitative assessment of project performance based on ADB's criteria for determining project rating.

B. Lessons Learned

55. While most of the significant delays were due to unforeseen causes, substantial administrative difficulties added to the delays in project implementation.

56. NEA had five project directors during the implementation of the Project. A project director was not assigned permanently to the project site until 10 October 2000. Before that, most of the project directors were absent from the site and spent most of their time in Kathmandu. Having so many project directors was not an efficient way to run the Project. For future projects, ADB should insist that NEA assigns one project director for the duration of the implementation period.

57. The relationship between NEA, the project implementation consultant, and the civil works contractor could have been improved. A large part of the delays in decision-making and management of the Project can be attributed to NEA not acting quickly enough. In some instances, NEA took more than a year to make decisions. ADB should ensure that the project director is capable of making decisions, and has knowledge of similar projects and what is entailed in the day-to-day running of these projects. Furthermore, to avoid administrative delays in future projects, ADB should ensure that NEA does not slow down project implementation with unnecessary and cumbersome administrative procedures.

58. The implementation period of the Project, as estimated at appraisal, was optimistic. The Project was the largest ever implemented in Nepal. Based on the difficulties faced by other projects implemented by NEA,²⁵ a longer implementation period should have been established.

59. In view of NEA's late submissions of audited project accounts and financial statements, ADB should consider directly appointing external auditors, with funding from the loan proceeds, to ensure timely submissions of audited project accounts and financial statements by tardy EAs.

60. For environmental, social, and resettlement issues, the Acquisition, Compensation and Resettlement Plan, and the reports by the panel of international experts focused excessively on employment and temporary benefits, studies, and reports without adequate emphasis on the post-construction decline. This is an important lesson for the design of future infrastructure projects. Without an appropriate plan to address the requirements for sustainable livelihood restoration of affected families, whose primary skill and knowledge are based on raising agriculture and livestock, incomes are likely to decline over time. The vulnerable group of marginalized Bote people, whose livelihoods depend on traditional fishing and ferrying people across the river using small boats, should be given equal access to work as transportation operators on the reservoir to ensure their sustainable livelihood. However, NEA has yet to sign a contract to engage ESSD to monitor the environmental and social aspects during the operation of the Project.

²⁵ ADB. 2001. *Project Completion Report on Seventh Power Project*. Manila (Loan No. 1011-NEP [SF]), June 2001).

C. Recommendations

1. Project-Related

a. Future Monitoring

61. The generation facilities that have been added under the Project are critical to the reliable operation of NEA's power system. The maintenance of the project facilities is essential to the long-term success of the Project. For them to remain in good working order, they must be maintained properly. ADB should keep in close contact with NEA to determine that maintenance is being undertaken correctly. ADB should also continue to follow up on the outstanding actions needed to be undertaken by NEA in the time-bound action plan agreed with the September 2003 Special Loan Administration Mission.

b. Covenants

62. The majority of the loan covenants that have not been complied with relate to financial matters. NEA needs to be monitored to ensure that the financial covenants are complied with on other loans. ADB should continue to monitor and review the financial viability of NEA. NEA needs to make further efforts to comply with the major loan covenants, so its operation as well as its commercial and financial performance can be elevated. Eventually, that would enhance the country's capability and capacity to tap domestic and international capital markets for more financial resources to increase the country's power supply.

c. Further Action or Follow-Up

63. Since the Project is part of the Government's least-cost development program to expand electricity generation, enhance power supply reliability, and improve power system control, it will be closely monitored during the implementation of subsequent loans.

d. Timing of Project Performance Audit Report Preparation

64. A Project Performance Audit Report should be carried out within 1–2 years. This would enable ADB to ensure that the monitoring of the Project is being undertaken efficiently, and any difficulties or problems encountered are resolved at an early stage.

2. General

a. Financial Control

65. Submission of audited project accounts and financial statements in Nepal falls short of ADB average. This area needs improvement and stronger corporate governance. Although financial statements were submitted during the Project, sometimes they were incomplete and not acceptable or were submitted late. It is essential that EAs (i) follow the ADB manual for project accounting, and (ii) include in the project accounts all resources spent for each project.

b. Executing Agency

66. The EA (NEA) needs to coordinate better its project management activities, streamline its approval process, and follow ADB guidelines and procedures from the outset. Communication between NEA and ADB also needs to improve. NEA replied to ADB requests for information in several instances after considerable delay.

c. Project Implementation

67. Having five project directors was counterproductive, and ADB should insist in the future that NEA ensure that a single project director be assigned to the Project for the duration of its implementation.

SUMMARY OF ADB CONTRACTS FUNDED

PCSS No.	Contractor/Supplier	Description	Contract Amount	US\$ Equivalent
A. Category 01 — Civil Works (Lots C1 and C3)				
0001	Impregilo S.P.A., Italy	Civil Works	US\$ 81,831,247	81,831,247
			LIT 59,466,715,083	31,146,541
			DM 15,556,716	8,117,559
			Total	121,095,347
B. Category 02 — Equipment (Loss Reduction Component)				
0005	ABB T&D, USA	Solid State Meters	US\$ 318,998	318,998
0006	Trishakti Cable, Nepal	ACSR Conductor	US\$ 79,500	79,500
0007	Mudbhary & Joshi Trade	Metering Unit	US\$ 199,950	199,950
0008	Zhejiang Technology, PRC	Current Transformers	US\$ 68,436	68,436
0010	Crystal Cable, India	ABC Cable	US\$ 125,603	125,603
0011	Milsoft Integrated Solutions	Software	US\$ 64,400	64,400
0012	Sicamex, France	Line Hardware	FF 698,278	98,827
0013	Lapworth Export, USA	Ammeters	US\$ 71,444	71,444
0014	Digitech, Nepal	Photovoltaic Relay	NRS 3,419,500	46,876
0015	Lapworth Export, UK	Meter Test Equipment	£ 17,184	25,514
8801	Various	Vehicles	Y 10,157,167	87,874
	Various		US\$ 49,530	49,530
8803	Lapworth Export, UK	Seal Pliers	£ 22,874	34,709
			Total	1,271,661
C. Category 03 — Consulting Services				
0002	Morrison Knudsen, USA	Consulting Services	US\$ 16,915,377	16,915,377
			NKR 4,787,614	637,804
			FMK 7,118,812	1,190,301
0003	Panel of Experts	Consulting Services	US\$ 851,600	851,600
0004	NRECA, USA	Consulting Services	US\$ 406,657	406,657
			NRS 5,066,985	72,380
0009	Mr. Every Hoek	Geotechnical Expert	US\$ 21,323	21,323
8802	Mr. Klaus Mussger	Consultant	S 137,244	10,711
			Total	20,106,153
Total Contracts Financed under the Loan				143,473,161

ABC = aerial bundled conductors, ACSR = aluminum clad steel reinforced, C1 = dam and desanding basin, C3 = headrace and tunnel, DM = German mark, FF = French franc, FMK = Finnish markka, LIT = Italian lira, £ = British pound, NKR = Norwegian krone, NRs = Nepalese rupee, PRC = People's Republic of China, T&D = transmission and distribution, UK = United Kingdom, USA = United States of America, US\$ = US dollar.

Source: ADB.

PROJECTED AND ACTUAL DISBURSEMENTS
(\$ Million)

Year	Projected	Actual
1997	13.71	29.26
1998	54.02	22.69
1999	31.04	27.03
2000	37.05	31.35
2001	24.18	22.70
2002		7.10
2003		0.53
Total	160.00	140.67

Source: ADB

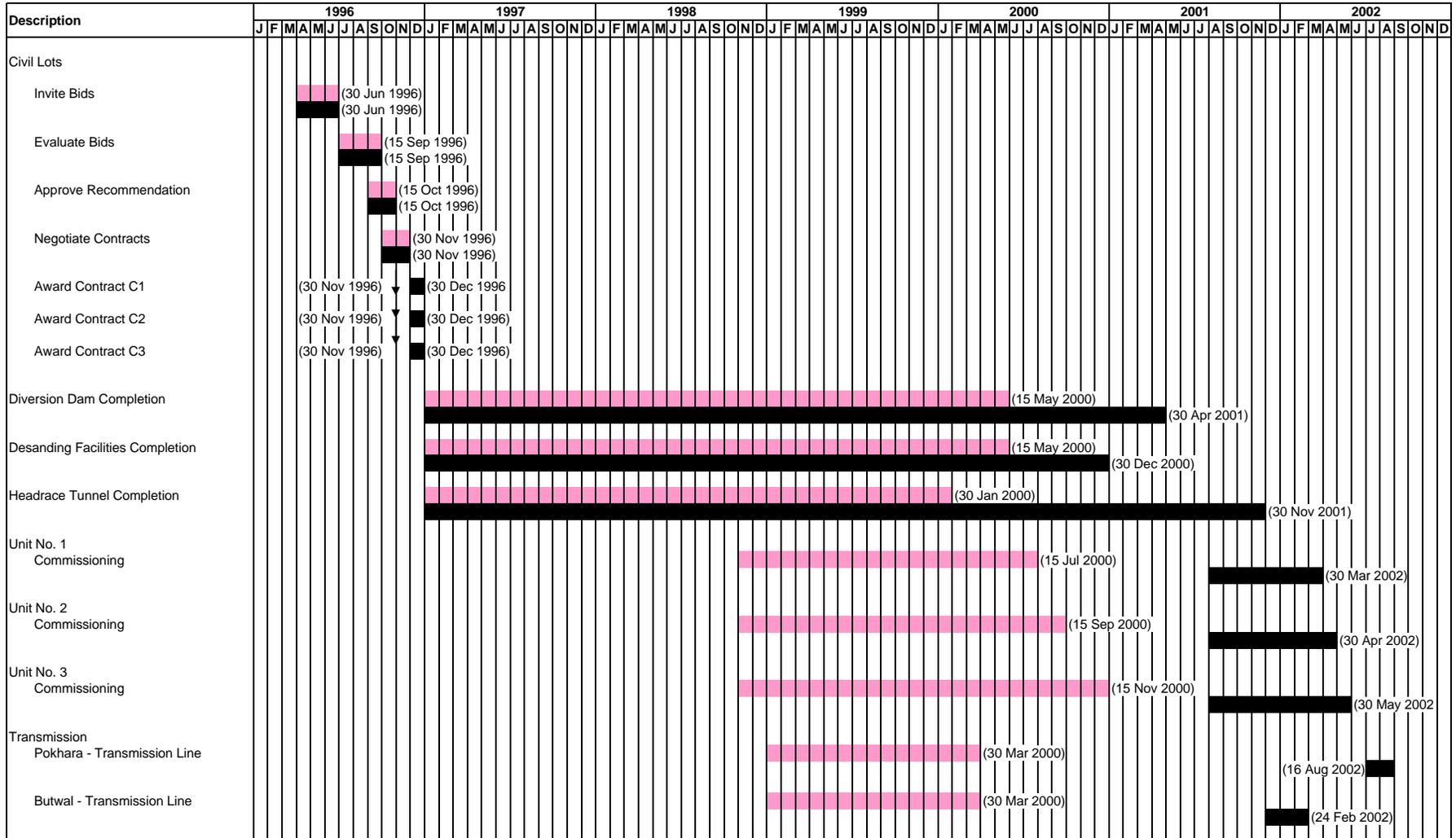
CHRONOLOGY OF MAJOR EVENTS

Date	Event
12 Jul 1994	Asian Development Bank (ADB) approves advance procurement action for civil works.
14 Jul 1996	Bids for civil works opened under advance procurement action.
23 Jul 1996	ADB approves a loan of \$160 million equivalent with Nepal Electricity Authority (NEA) acting as the Executing Agency.
27 Aug 1996	Loan and Project Agreements signed in Kathmandu, Nepal.
24 Sep 1996	Letters signed for TA 2613-NEP: Institutional Strengthening of NEA's Environment Division, and TA 2614-NEP: Power System Master Plan.
14 Oct 1996	Loan Agreement signed between Overseas Economic Cooperation Fund of Japan, which subsequently was renamed Japan Bank for International Cooperation (JBIC), and the Government of Nepal for US\$160 million equivalent.
12 Nov 1996	Cofinancing of \$160 million loan with JBIC for the Kali Gandaki Project becomes effective.
12 Dec 1996	Loan becomes effective.
30 Jun–11 Jul 1997	Inception Mission fielded.
23 Sep 1997	ADB approves NEA's request that the Loan Agreement be amended to increase ADB financing of the foreign currency portion of the loan for civil works from 82% to 89%.
1–14 Dec 1997	First meeting of panel of experts is held in Kathmandu.
3–9 Dec 1997	First Review Mission notes that the project is running 3–5 months behind schedule.
24 Feb–15 Mar 1998	Review Mission fielded. Problems with desander slope arise. Specialists investigate the problem and propose remedial measures.
26 Aug–5 Sep 1998	Review Mission fielded. The Mission reiterates the recommendation of the Feb–Mar 1998 Mission that ADB should assist NEA in disseminating in a professional manner its efforts to a larger public, and particularly to concerned NGOs.
18 Aug 1998	KGEMU manager and community liaison officer appointed to work under the consultant.
17–28 Mar 1999	Review Mission fielded. Serious differences in opinion noted between NEA, the consultant, and the contractor, which could lead to arbitration

	proceedings. The Mission endorses the establishment of a Dispute Review Board, and recommends that half of its costs be borne under the loan.
21–29 Jan 2000	Review Mission fielded. Lack of permanent staff of KGEMU, in spite of numerous follow-ups, is noted. The contract of the manager of KGEMU was not extended, and KGEMU is now without a manager.
3 Jun 2000	Copy of the panel of experts' letter to NEA is provided to ADB. Several important environmental and social issues are raised by the panel.
3–13 Sep 2000	Review Mission fielded. It reports various strikes, triggered by a fatal accident, and civil unrest in the contractor's camp. A police force is deployed to prevent a repetition of such incidents.
6–20 Sep 2000	Special Loan Administration Mission is fielded to discuss the operations of the KGEMU and contractual issues affecting the implementation of the Project.
14 Nov–4 Dec 2000	Review Mission fielded. A memorandum concerning the implementation of a work plan for KGEMU is prepared by the panel of experts.
30 Dec 2000	Desander basin is completed.
30 Apr 2001	Diversion dam is completed.
23–10 May 2001	Review Mission fielded to assess (i) environmental and social aspects; and (ii) financial and construction implementation issues. The visit coincides with the visit of the panel of experts.
25 Jun 2001	At the request of the Government, ADB approves extension of loan closing date from 15 July 2001 to 15 July 2003.
Jun 2001	ADB approves NEA's request to allow two of its senior staff to visit Washington D.C. for a meeting with an international hydraulic expert in connection with the need for further simulation studies of the potential backwater flooding in the vicinity of the Holy Stone and Seti Beni Bazaar village next to the Holy Stone.
16–25 Nov 2001	Review Mission fielded.
30 Nov 2001	Headrace tunnel is completed.
24 Feb 2002	Transmission line from power plant to Butwal is commissioned.
31 Mar 2002	The first 48-megawatt generating unit is commissioned.
19 Apr 2002	The second generating unit is commissioned.
24 May 2002	The final unit is commissioned.

- 31 Jul 2002 ADB approves NEA's request to engage a consultant advisor in establishing the sediment monitoring laboratory at the project site.
- 16 Aug 2002 Transmission line from power plant to Pokhara is commissioned.
- 2–11 Oct 2002 Review Mission fielded. NEA and the contractor agree to a plan to construct housing for the remaining 10 Bote families.
- 23 Oct 2002 Agreement reached that the contractor would construct houses for 4 Bote families, while NEA would construct houses for 6 Bote families.
- 9–24 Sep 2003 Special Loan Administration Mission fielded to assess the implementation performance of the Project, covering financial, economic, technical, environmental, and social aspects.
- 13–28 Jan 2004 Project Completion Review Mission fielded. His Majesty, the King of Nepal, inaugurates the Project on 22 January 2004.

PROJECT IMPLEMENTATION SCHEDULE



C1 = dam and desanding basin civil works contract, C2 = headrace tunnel civil works contract, C3 = power station civil works contract.

Legend:
 Expected
 Actual

PROJECT IMPLEMENTATION DIFFICULTIES

1. The Project was to be operational by 15 January 2001. However, several problems during project implementation delayed the completion. The delays were technical and non-technical.

1. Technical—Unforeseen Delays

2. The technical delays, most of which were unforeseeable, were attributable mainly to four major causes: (i) desander backslope redesign, (ii) second diversion of the river through the desander, (iii) adverse rock conditions in the headrace tunnel, and (iv) geotechnical rock conditions at the surge tank.

- (i) On the slope behind the desander, originally under excavation at an angle of 1H:1V,²⁶ minor cracks developed in February 1998 in the shotcrete protection layer over the phyllite on the benches at elevations 605 meters (m) and 590 m, suspending further trimming works. In an attempt to stabilize the berms, long dowels were installed above the berms at elevations 590 m and 605 m. When additional cracks developed at the top of the slope some time later, it was decided to unload the slope by cutting it back in the phyllite above elevation 570 m to 1.5H:1V.²⁷ During further excavation of the desander to temporary profile, various new geological conditions were encountered. The contact between the overlying phyllite and the underlying dolomite was found to be generally at a lower elevation than had been projected. To allow for a margin of safety, it was decided to realign the slope all the way from the road at elevation 526 m up to the top at an angle of 1.8H:1V. The final designs for the realigned road and the revised slope configuration were issued to the contractor on 27 August 2000 and on 2 September 2000, respectively.²⁸
- (ii) The first river diversion through the desander basin lasted from November 1998 to June 1999. A second diversion of the river through the desander was required principally due to sedimentation that had occurred in the dam blocks during the 1999 monsoon. The dam blocks needed to be excavated to depths of up to 7-8 m to allow the work of both contractors under Lot C1 and Lot 4 to proceed. The river was diverted back through the dam on 18 April 2000.
- (iii) In view of the geological conditions encountered in the headrace tunnel after commencement of construction, the rock support classifications were modified. Thus, they differed substantially from those estimated originally in the bill of quantities. The number of steel ribs and quantities of shotcrete had to be increased significantly from those in the tender documents. As a consequence, the excavation of the tunnel and its concrete lining were delayed substantially.²⁹ An additional of 334 working

²⁶ 1H:1V stands for one unit vertical distance over one unit horizontal distance.

²⁷ At the time, the geological contact between the phyllite and dolomite had been exposed on part of the slope at an elevation around 573 m, and it was believed that the flattened slope would intercept this contact above elevation 570 m along the majority of the excavated slope.

²⁸ The additional time required to finish the excavation of the desander backslope had a significant impact on the completion of the headworks.

²⁹ Start of the tunneling work was delayed for approximately 4 months at the upstream adit, and for approximately 7 months at the downstream adit. This was principally due to the late mobilization of equipment to the site by the

days were required to excavate the headrace tunnel, which moved the wet test date for the tunnel from June 2000 to September 2001.

- (iv) During the excavation of the surge tank, the left wall of the tank collapsed on 25 June 1999 when the remaining depth for excavation was about 12 m. To stabilize the wall and prevent further collapses, the surge tank was then refilled with muck excavated from the headrace tunnel. The design subsequently was revised to include ring beams installed around the wall of the surge tank. The shaft then was re-excavated. Only after these major repair works could excavation of the surge tank be continued down to its bottom. This unforeseen event delayed the wet testing of the works at the powerhouse for 12 months, from July 2000 to July 2001.

2. Non-Technical Delays

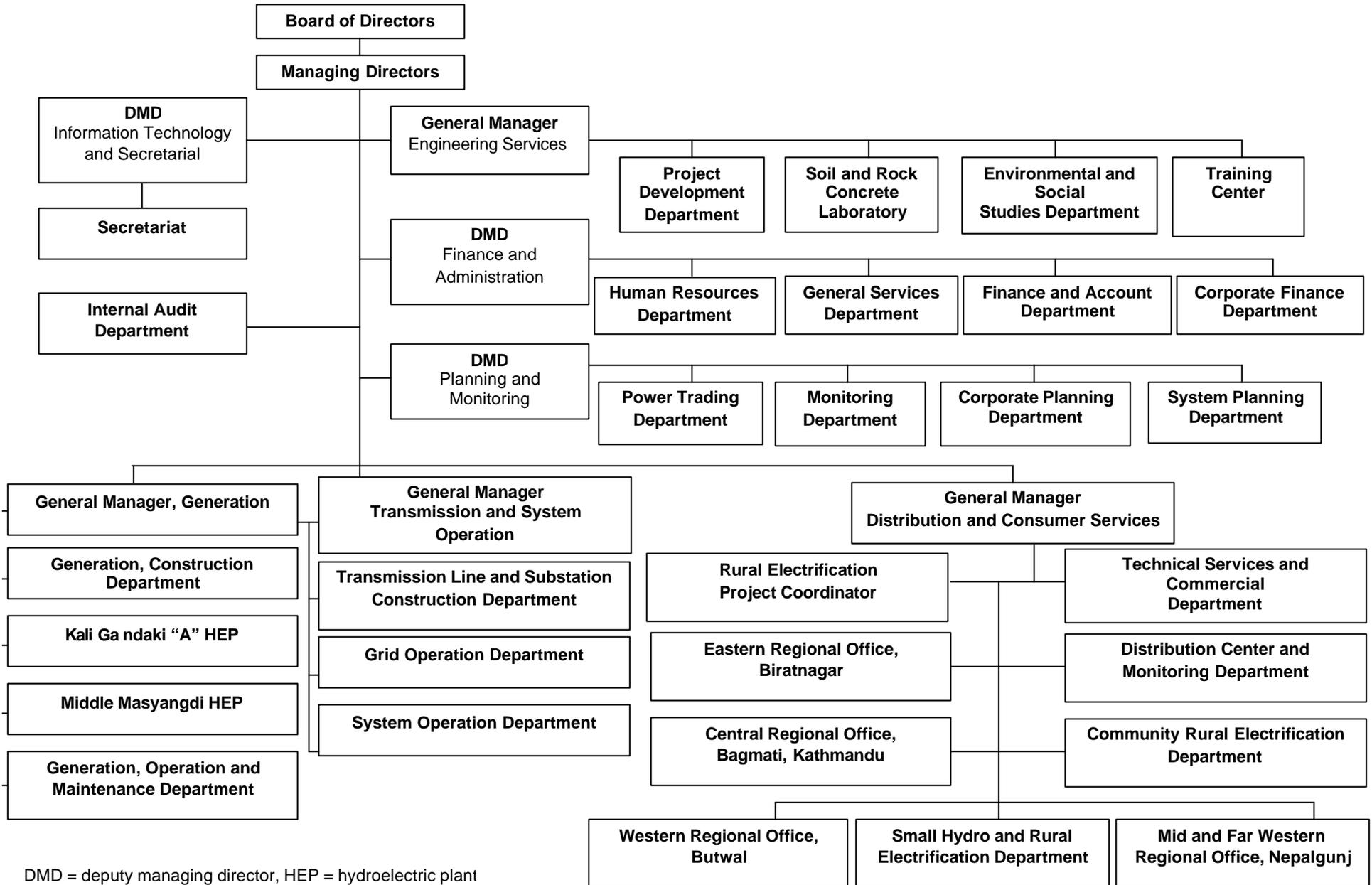
3. The non-technical delays were caused by the relationship between NEA, the project implementation consultant, and the civil works contractor. Although the Asian Development Bank (ADB) tried to assist NEA in resolving issues by drawing up action plans,³⁰ the problems grew worse as the Project progressed.

- (i) On numerous occasions, NEA senior project staff were heavily engaged in matters that required their presence in Kathmandu rather than at the project site.
- (ii) Major decisions were passed on by the project director to NEA's Board. The project director had the responsibility for running the Project, but not the authority, according to the Government's Financial Administration Regulations.
- (iii) A project director was relocated to the project site on a permanent basis on 10 October 2000. During implementation of the Project, there were five project directors.
- (iv) NEA took more than a year to issue a determination to the contractor on the request for an extension for project completion. The contractor submitted the extension on 14 October 1998; NEA issued its determination on 19 October 1999.
- (v) NEA significantly delayed approving consultants staffing variations.

contractor. Additionally, the equipment resourcing of the contractor was not very efficient under the conditions encountered, and it became apparent that the equipment selection was not appropriate for the size of the tunnel. The contractor had to adopt a revised methodology to improve progress.

³⁰ Virtually none of the agreements reached by ADB and NEA during the Special Loan Administration Mission of September 2000 concerning institutional arrangements of the project administration were fulfilled by NEA. Where they were fulfilled, they were no longer effective.

CORPORATE STRUCTURE OF NEPAL ELECTRICITY AUTHORITY ORGANIZATION CHART



DMD = deputy managing director, HEP = hydroelectric plant
Source: Nepal Electricity Authority.

STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference	Status of Compliance
Project Implementation		
1. Appointment of a project director who shall be responsible in all matters related to project implementation.	Loan Agreement (LA), Schedule 6, para. 1	Complied with.
2. Borrower shall furnish quarterly reports on carrying out the Project.	LA, Schedule 6, para 1	Complied with. Monthly reports were submitted regularly.
3. Appointment of panels of international experts within 3 months of the effective date.	LA, Schedule 6, para. 2	Complied with. Last panel of experts' meeting was in January 2002.
4. Promptly implement the recommendations made by the panels of international experts in a manner satisfactory to the Asian Development Bank (ADB).	LA, Schedule 6, para. 2	Partially complied with. Monitoring of environmental and social mitigation measures were phased out too early.
Environmental		
5. Establish Kali Gandaki Environmental Monitoring Unit (KGEMU) within 3 months of the effective date.	LA, Schedule 6, para. 3	Delayed compliance. KGEMU was established in March 1997 with several staff. The unit manager was not appointed until August 1998.
6. Release of 4 cubic meters per second (m ³ /s) of water during the dry season from the dam to mitigate the loss to riverine, primarily in the first 13 kilometers (km) immediately after the dam.	LA Schedule 6 para. 6	Delayed compliance after the September 2003 Special Loan Administration Mission.
7. Nepal Electricity Authority (NEA) to coordinate or cause to coordinate the recommendations contained in Acquisition, Compensation and Resettlement Plan, Environmental Impact Assessment and Mitigative Measures Monitoring Plan as well as relevant contractual provisions between NEA and contractors.	LA Schedule 6 para. 8	Complied with.
8. NEA shall carry out post-construction environmental and social impact audit within 3 months	LA Schedule 6 para. 10	Delayed compliance. Final audit report received by ADB on 26 February 2004.

Covenant	Reference	Status of Compliance
of project completion, and furnish to ADB a copy of such audit within 4 months of the completion of the completion of the project.		
9. During project implementation, the Borrower and NEA will carry out an environmental monitoring program, satisfactory to ADB, and will submit the reports to ADB, on a quarterly basis, within 30 days from the end of each quarter. The primary objective of the monitoring program will be to identify problem areas in sufficient time to initiate viable solutions.	LA, Schedule 6 para. 9	Complied with.
Social/Resettlement		
10. The project director to ensure satisfactory implementation of agreed upon environmental mitigation measures and measures to provide an employment opportunity for at least one person from each seriously project-affected family (SPAF) living in the project area, and further opportunities for the women living the in project area to establish small handicrafts, trading, and manufacturing enterprises.	LA, Schedule 6, para. 1	Partially complied with. Employment opportunity for SPAFs was mostly complied with. Occasionally concerns were raised about the contractor not fully complying with hiring in priority order as prescribed in the contract. But considering NEA and KGEMU together, there was compliance on providing employment to SPAFs, project-affected families (PAFs) and local residents during construction. Furthering opportunities specific to women was partially complied with.
11. Carry out the Acquisition, Compensation and Resettlement Plan, Environmental Impact Assessment and Mitigative Measures Monitoring Plan in accordance with the principle, objectives and provisions thereof. In carrying out these plans, NEA shall promptly implement the recommendations made by the panel of experts for environmental and social aspects and KGEMU in a manner satisfactory to ADB.	LA, Schedule 6, para. 7	Partially complied with. The Project has made considerable progress on the various elements of the resettlement and mitigation process for the Bote Community.

Covenant	Reference	Status of Compliance
<p>12. With respect to Acquisition, Compensation and Resettlement Plan, the Borrower shall take or cause to be taken all necessary measures to ensure that all the population adversely affected by the Project shall generally (i) improve or at least regain their prior standard of living; (ii) be relocated, if necessary, in accordance with their preferences and be fully integrated into the community in which they move; and (iii) be provided with appropriate agreed upon compensation and required physical rehabilitation of infrastructure, community facilities, including rehabilitation grants, services skills training and employment opportunities.</p>	<p>LA, Schedule 6, para 7.</p>	<p>Partially complied with. Land was acquired several times between 1992 and 2003. Many families were affected more than twice by land acquisition and some households had to be relocated twice due to the same project. This is an important lesson learned.</p>
<p>13. Public Participation: The Borrower and NEA shall, through the Project Information Centers in Kathmandu and in the project area staffed with full-time NEA personnel, carry out agreed upon public participation and consultation activities and provide annual reports on the progress of carrying out such activities no later than 30 June of each year beginning within 1 year of the effective date. The Borrower shall cause NEA to continue to utilize the informal Project Village Advisory Groups, recognized by NEA, as a vehicle for communication between project-affected families and NEA on any matter of mutual interest concerning the Project.</p>	<p>LA, Schedule 6, para. 11</p>	<p>Partially complied with. No separate report was submitted on public participation. However, NEA has continued to hold consultations with PAFs through the Village Advisory Groups.</p>
<p>14. NEA shall cause the engineer to engage at least 1,000 person-months of Nepalese local technical personnel during the project construction phase.</p>	<p>LA. Schedule 6, para. 12</p>	<p>Partially complied with. The required numbers of Nepalese local technical persons were often unavailable.</p>

Covenant	Reference	Status of Compliance
15. NEA shall install an early warning system for flood by 31 March 1999 and operate and maintain such system satisfactory to ADB.	LA. Schedule 6, para. 13	Partially complied with. Additional sirens were installed after September 2003 Special Loan Administration Mission.
16. NEA shall continue to evaluate the risk of floods and to take adequate measures to mitigate such risks	LA. Schedule 6, para. 13	Complied with. Additional simulation studies completed in March 2004 and report received on 6 April 2004.
17. The project director shall ensure environmental and socio-economic conditions are monitored during project operation with reference to Acquisition, Compensation and Resettlement Plan, Environmental Impact Assessment and Mitigative Measures Monitoring Plan.	LA. Schedule 6, para. 16a	Delayed compliance. During transition of phasing out of KGEMU and resumption of its work by NEA, institutional communication was lacking. NEA has instituted an Environmental and Social Studies Department to continue the work of KGEMU.
18. NEA shall continue to invest at least 1% of NEA's net revenue generated from the existing hydropower plants in the rural electrification in and near such NEA hydropower plants. As soon as the dam and the power station are commissioned, NEA shall invest 1% of net revenue generated from the power station in rural electrification in areas directly affected by the dam and power station.	LA. Schedule 6, Para 32	Complied with. About 3,000 households in the vicinity of the project site have been provided with electrification.
Financial		
19. NEA shall adjust its tariffs at least annually to achieve an annual rate of return (ROR) of not less than 6% on revalued fixed assets starting FY1998; and thereafter.	Project Agreement (PA), Section 2.16	Not complied with. No tariff increase after 2001. ROR was: 0.4% for FY1998 0.3% for FY 1999 2.2% for FY2000 -0.1% for FY2001 1.3% for FY2002 2.4% for FY2003
20. NEA's tariff shall be adequate to achieve a self-financing ratio	LA, Schedule 6, para. 18(a)	Not complied with.

Covenant	Reference	Status of Compliance
(SFR) of: FY1997 – 18%; FY1998 – 20%; and FY1999 and thereafter – 23%.		SFR was: 6.5% for FY1997 6.5% for FY1998 9.0% for FY1999 22.1% for FY2000 10.3% for FY2001 6.2% for FY2002 13.0% for FY2003
21. NEA shall achieve a debt service ratio (DSR) of not less than 1.2.	PA, Section 2.17	Complied with. DSR was: 2.1 for FY1998 1.6 for FY1999 2.0 for FY2000 1.8 for FY2001 2.0 for FY2002 1.6 for FY2003
22. NEA's accounts receivable should not exceed the equivalent of NEA's sales revenue for 3 months.	LA, Schedule 6, para. 20(a)	Not complied with. Accounts receivable were: 3.9 months for FY1998 4.2 months for FY1999 2.5 months for FY2001 3.3 months for FY2002 3.6 months for FY2003
Audited Project Accounts and Financial Statements		
23. NEA to provide ADB audited project accounts and financial statements not later than 9 months after the close of fiscal year.	PA. Article II, Section 2.09(a)	Complied with late. Audited project accounts for FY2002, due on 30 April 2003, received in February 2004 and audited financial statements received late in June 2003 as in past years.
Economic Efficiency		
24. NEA will achieve a ratio of at least 75 consumers/employee by FY2000.	LA, Schedule 6, para. 24	Delayed compliance. The ratio for FY2002 was 83.7
25. NEA will provide each year for ADB's review a draft corporate plan setting forth NEA's strategic plans at least 90 days prior to the start of each fiscal year, covering the subsequent 3 years. NEA will take	LA, Schedule 6, para. 28	Delayed compliance. The Development Corporate Plan for FY2003 to FY2007 was only received on 17 September 2003.

Covenant	Reference	Status of Compliance
account of the ADB's comments in finalization of the plan.		
<p>26. Loss Reduction: NEA shall reduce system losses to:</p> <p>FY1997 – 23%; FY1998 – 22%; FY1999 – 21%; Thereafter – 20%.</p>	<p>LA, Schedule 6, para. 25.</p>	<p>Not complied with.</p> <p>The system losses were: 21.5% for FY1998 22.8% for FY1999 23.8% for FY2000 24.2% for FY2001 24.8% for FY2002 23.6% for FY2003</p>
Others		
<p>27. NEA will (a) provide ADB within 6 months of loan effectivity with a draft of its Commercialization Study Report, (b) take account of ADB's comments in finalizing the report's recommendations, (c) submit a satisfactory implementation plan, and (d) implement the plan and each year report on progress achieved.</p>		<p>Complied with. Final Report on NEA's Commercialization Study received in February 1998.</p>
<p>28. NEA shall establish a fish hatchery and implement a fish trapping and hauling program.</p>		<p>Partially complied with. Construction of fish hatchery was completed and is now being operated by Nepal Agriculture Research Council. The capacity of this hatchery is about 30 million eggs, 10 million fry and 2 million fingerlings.</p> <p>Fish trapping and hauling not complied with.</p>

TARIFF STRUCTURE
(Effective from Billing of September 17, 2001)

1. DOMESTIC CONSUMERS**A. Minimum Monthly Charge**

Meter Capacity	Mimimum Charge (NRs)	Exempt (kWh)
Upto 5 ampere	80.00	20
15 ampere	299.00	50
30 ampere	664.00	100
60 ampere	1394.00	200
Three phase supply	3244.00	400

B. Energy Charge

Up to 20 units	NRs. 4.00 per unit
21–250 units	NRs. 7.30 per unit
Over 250 units	NRs. 9.90 per unit

2. Temple

Energy charge	NRs. 5.10 per unit
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3. Street Lights

With Meter	NRs. 5.10 per unit
Without Meter	NRs. 1860.00 Per kVA

4. Temporary Supply

Energy charge	NRs. 13.50 per unit
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5. Community Wholesale Consumer

Energy charge	NRs. 3.50 per unit
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6. Industrial

Voltage	Monthly Demand Charge (NRs/kVA)	Energy Charge (NRs/unit)
Low Voltage (400/230 volt)		
Rural and Cottage	45.00	5.45
Small Industry	90.00	6.60
Medium Voltage (11kV)	190.00	5.90
Medium Voltage (33 kV)	190.00	5.80
High Voltage (66 kV and above)	175.00	4.60

7. Commercial

Low voltage (400/230 volt)	225.00	7.70
Medium voltage (11kV)	216.00	7.60
Medium voltage (33 kV)	216.00	7.40

8. Non-Commercial

A. Low voltage (400/230 volt)	160.00	8.25
B Medium voltage (11kV)	180.00	7.90
C Medium voltage (33 kV)	180.00	7.80

kV = kilovolt, kVA = kilovolt ampere, kWh = kilowatt hour, NRs = Nepalese rupee.
Source: Nepal Electricity Authority.

FINANCIAL STATEMENTS

1. Financial statements for Nepal Electricity Authority (NEA) were obtained to examine the performance of NEA over recent years. A balance sheet, an income statement, and a source and application of NEA funds for FY1995–FY2002 also were obtained. In addition, NEA provided forecasts of these financial statements up to FY2007.
2. The income statement shows that the rate of return (ROR) on revalued assets³¹ in 1995 was only 4.4%. In subsequent years, the ROR remained below 6%—the loan covenants stated that NEA was to reach a ROR of at least 6% by FY1998—and in FY 2001 the ROR was –0.1%. ROR improved to 1.3% in FY2002 and 2.4% in FY2003. Only in the forecasts for FY2004 and onwards is ROR expected to exceed 6%.
3. The balance sheet shows that accounts receivable³² in FY1998 were the equivalent of NEA's sales revenue for 3.9 months. The following year (FY1999) accounts receivable were 4.2 months. A covenant in the Loan Agreement stipulates that accounts receivable should not exceed the equivalent of NEA's sales revenue for 3 months by the end of FY1997. However, accounts receivable did not fall below that target rate until FY2001, when they totaled 2.5 months. Accounts receivable were the equivalent of 3.3 months of NEA's annual sales revenue in FY2002 and 3.6 months in FY2003.
4. Under the Loan Agreement, the self-financing ratio (SFR) was to be at least 18% in FY1997, 20% in FY1998, and 23%³³ in FY1999 and thereafter. From FY1996 to FY1999, the SFR reached a maximum of 9.0%. The SFR was 21.5% in FY2000, 10.3% in FY2001, 6.2% in FY2002, and 13% in FY2003. In the forthcoming years, NEA estimates that the SFR will rise from approximately 24% in FY2004 to approximately 33% by FY2007.
5. Loan covenants stipulate that the debt service coverage ratio should be at least 1.2 times the maximum debt service requirements in any year on all debt incurred by NEA. This financial requirement has been met. The ratio was 2.0 in FY2000, 1.8 in FY2001, 2.0 in FY2002, and 1.6 in FY2003.
6. Under the Project Agreement, NEA must furnish ADB with certified copies of audited financial accounts for its annual operations within 9 months of the close of each fiscal year. For FY1999, audited accounts were due by 16 April 2000. While ADB received a preliminary audit, the final audited accounts were overdue. The audited financial accounts for FY2002, which were due in April 2003, were received in February 2004. The audited accounts of previous financial years were often overdue. This covenant usually was not complied with.

³¹ Operating income divided by average revalued assets in service.

³² Accounts receivable divided by average monthly sales revenue.

³³ The SFR subsequently was changed to be at least 22% in line with the Rural Electrification Loan.

NEA's BALANCE SHEET
(NRs million)

Fiscal year ending 15 July	Audited			Audited	Estimate	Forecast							
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Fixed Assets													
Gross fixed assets	42881.0	46038.3	46459.0	48913.2	51941.9	55772.3	60958.3	70038.6	105094.4	113144.1	132427.4	146589.9	166307.4
Less: depreciation	14467.4	16600.0	17825.6	19021.8	20718.9	22460.5	25362.8	28607.5	32671.2	37607.5	43202.2	49570.7	56742.6
Net fixed assets	28413.6	29438.3	28633.4	29891.3	31223.0	33311.9	35595.6	41431.1	72423.2	75536.6	89225.2	97019.2	109564.7
Work in progress	5229.2	7362.7	11974.6	14143.1	17013.2	23255.7	33973.9	38319.8	15740.6	22400.6	17649.6	16146.8	7381.1
Total Net Fixed Assets	33642.8	36801.0	40608.0	44034.4	48236.2	56567.6	69569.5	79750.9	88163.8	97937.2	106874.8	113166.0	116945.8
Deferred Charges (Studies)	588.6	410.8	267.3	443.3	615.0	395.0	201.2	201.2	201.2	201.2	201.2	201.2	201.2
Current Assets													
Cash	134.4	64.9	89.2	106.8	88.6	272.9	475.0	575.7	609.8	703.0	758.5	872.3	1488.6
Inventories	429.1	618.0	804.0	914.9	740.1	725.0	609.6	655.0	830.3	870.5	966.9	1037.7	1136.3
Accounts receivable	682.6	1040.0	1209.1	1435.4	1530.9	1712.5	2275.3	2613.8	2917.1	3357.5	3742.2	4234.1	6074.6
Advances recoverable	471.7	805.2	1328.9	1709.7	1634.2	1300.0	1365.0	1501.5	1651.7	1816.8	1998.5	2198.3	2418.2
Total current assets	1717.8	2528.1	3431.3	4166.8	3993.8	4010.5	4724.9	5346.1	6008.8	6747.8	7466.1	8342.5	11117.8
Investments (Miscellaneous)			150.0	247.6	326.1	326.1	326.1	326.1	326.1	326.1	326.1	326.1	326.1
Investments in Bonds/Short Term Dep/Other	1165.3	1133.8	1317.9	1386.1	857.4	830.7	17.6	2071.2	3953.2	5767.9	6740.3	8550.7	10953.7
Investment (Self Insurance)	80.0	100.0	120.0	140.0	160.0	180.0	200.0	220.0	240.0	260.0	280.0	300.0	320.0
TOTAL ASSETS:	37194.4	40973.7	45894.5	50418.1	54188.6	62309.9	75039.2	87915.5	98893.1	111240.2	121888.6	130886.5	139864.6
Equity													
HMG's Cap.Contr.& Frn. Grants	8122.9	9231.6	10952.6	12324.3	13365.9	14057.2	15031.3	15699.8	16190.5	17117.2	18070.9	18793.5	19172.1
Cap.Res.(Cons.Contr.&Cap. Gains)	147.9	158.6	158.8	158.8	158.8	158.8	158.8	158.8	158.8	158.8	158.8	158.8	158.8
Insurance Fund	98.6	118.6	138.6	158.6	178.6	198.6	218.6	238.6	258.6	278.6	298.6	318.6	338.6
Retained Earnings	-338.2	340.4	1027.8	1181.5	1065.5	2047.6	3038.6	5338.3	6780.5	8553.4	10205.8	12255.7	14803.1
Revaluation Reserve	14286.2	14799.3	13421.4	11930.2	10664.4	9571.0	10285.4	11098.5	12097.3	14568.0	17025.1	19966.1	23038.7
TOTAL EQUITY:	22317.4	24648.6	25699.3	25753.5	25433.3	26033.3	28732.8	32534.1	35485.7	40676.1	45759.3	51492.8	57511.3
Long Term Debt (Incl.Mars.Cost)	12444.8	13980.0	16484.9	19932.1	22910.0	30128.9	40376.7	49064.2	55953.7	62141.4	66483.8	68648.5	68977.2
Long Term Debt (Marsy.unpd.int.)	922.4	920.4	918.3	916.3	914.3	912.2	910.2	908.2	906.2	904.1	902.1	900.1	898.0
Current Liabilities													
Inter-unit Balance (net)	-144.5	-335.7	-133.2	-188.7	256.9	-50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Payable to HMG	1029.0	962.9	1561.8	2190.1	1727.2	2355.8	2000.0	2101.9	2893.5	3123.6	3770.6	4002.9	4706.5
Accounts payable	51.5	41.8	461.5	250.8	1052.9	609.6	600.0	542.3	585.1	661.1	738.7	822.0	916.8
Miscellaneous deposits/Other Liabilities	531.1	693.6	696.9	950.7	1076.8	1570.0	1664.9	1915.2	2268.0	2688.4	3189.4	3787.0	4500.2
Short term Debt/Bank overdraft.	0.0	0.0	0.0	0.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0
Purchase of energy	8.3	6.6	4.3	377.6	595.4	500.0	504.6	664.6	699.4	805.9	857.8	1017.7	2130.9
Accrued tax liability	34.4	55.6	200.6	235.6	221.6	250.0	250.0	185.0	101.4	239.6	186.9	215.6	223.7
Total current liabilities	1509.7	1424.7	2792.0	3816.3	4930.8	5235.4	5045.5	5409.0	6547.5	7518.5	8743.4	9845.2	12478.1
TOTAL LIABILITIES:	14877.0	16325.1	20195.2	24664.6	28755.1	36276.6	46332.5	55381.4	63407.4	70564.1	76129.3	79393.8	82353.3
TOTAL EQUITIES AND LIABILITIES:	37194.4	40973.7	45894.5	50418.1	54188.6	62309.9	75065.3	87915.5	98893.1	111240.2	121888.6	130886.5	139864.6
Long-Term Debt to Total Capit (%)	35.8	36.2	39.1	43.6	47.4	53.6	58.4	60.1	61.2	60.4	59.2	57.1	54.5
RATIOS													
Current ^(a)	1.9	2.6	1.7	1.5	1.0	0.9	0.9	1.4	1.5	1.7	1.6	1.7	1.8
Debt/(Debt+Equity) ^(b)	60.8	58.7	57.3	59.0	60.8	64.7	68.6	69.6	70.5	70.4	69.8	68.5	66.7
Accounts receivable (months) ^(c)	2.5	3.3	3.0	3.4	3.4	3.0	3.0	2.5	2.5	2.5	2.5	2.5	2.5
Accounts payable (months) ^(d)	0.6	0.4	4.0	1.5	5.5	3.3	2.7	2.2	2.2	2.2	2.2	2.3	2.2

^(a) Current assets divided by current liabilities

^(b) Long term debt divided by long term debt plus equity less revaluation surplus

^(c) Accounts receivable divided by average monthly sales revenue

^(d) Accounts payable divided by average monthly cash operating expenses (ie, excluding depreciation)

IDC = interest and service charges during construction, NEA = Nepal Electricity Authority, P&L = profit and loss.

Source: Nepal Electricity Authority.

NEA's PROFIT & LOSS STATEMENT
(NRs million)

Table 1

Fiscal year ending 15 July	Audited			Audited Estimate			Budget Estimate			Forecast			
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
NEA's Hydro-energy Availability	842.0	1050.8	1058.7	939.9	1015.6	1200.7	1290.8	1546.2	2029.1	2107.3	2474.9	2644.7	3212.8
Hydro-energy spilled (GWh)							58.6	347.7	664.8	697.3	821.3	882.9	1139.3
Hydro Generation (GWh)	842.0	1050.8	1058.7	939.9	1015.6	1200.7	1232.2	1198.5	1364.3	1410.0	1653.6	1761.8	2073.5
Small Hydro (Isolated)	6.7	21.9	38.0	32.1	30.9	32.6	32.6	8.0	8.0	8.0	8.0	8.0	8.0
Thermal (Multifuel)	80.9	36.6	39.7	107.5	118.8	66.7	37.3	27.8	4.9	12.2	11.6	7.0	3.4
Total Energy Generated	929.7	1109.4	1136.4	1079.4	1165.3	1300.0	1302.1	1234.3	1377.2	1430.2	1673.2	1776.8	2084.9
Energy Purchased from India (GWh)	113.8	73.0	154.0	210.3	232.4	232.2	120.0	11.8	0.5	0.3	1.2	0.0	0.0
Energy Purchased from Andhi/Jhimruk	74.0	80.6	78.2	83.5	77.3	80.0	70.0	103.0	103.0	103.0	103.0	103.0	103.0
Energy Purchased from other HEP			0.0	0.0	0.0	89.3	497.7	700.0	794.3	884.3	884.3	884.3	884.3
Total Energy Available (GWh)	1117.5	1263.0	1368.6	1373.2	1475.0	1701.5	1989.8	2049.1	2275.0	2417.8	2661.7	2764.1	3072.2
NEA consumption (GWh)	12.8	15.4	16.9	19.9	23.6	25.6	29.9	32.9	36.2	39.8	43.8	48.1	52.9
System Losses (GWh)	280.0	310.9	341.1	296.6	337.8	406.6	428.4	409.9	412.7	420.2	425.3	429.4	466.2
Net System Losses as a % Available Energy	25.1%	24.6%	24.9%	21.6%	22.9%	23.9%	21.5%	20.3%	19.3%	18.3%	17.2%	16.2%	16.2%
Electricity Sales (GWh) - Nepal	785.1	849.7	910.4	989.3	1049.4	1174.3	1351.5	1501.4	1610.3	1756.0	1911.1	2077.1	2261.1
- India	39.5	87.0	100.2	67.4	64.2	95.0	180.0	72.0	77.8	84.0	90.7	98.0	105.8
Total Electricity Sales (GWh)	824.6	936.7	1010.6	1056.7	1113.6	1269.3	1531.5	1573.4	1688.1	1840.0	2001.8	2175.1	2366.9
Additional Electricity Sales to India (GWh)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.9	138.0	117.8	190.8	111.5	186.2
Average revenue rate (NRs/kWh)	4.0	4.1	5.0	4.9	5.0	5.6	6.3	8.1	8.1	8.6	8.6	9.2	12.1
Increase in Average Revenue rate	0.0%	4.3%	19.7%	-0.6%	0.4%	12.5%	12.5%	28.7%	0.3%	6.5%	0.0%	6.8%	31.3%
Electricity Sales - Nepal	3120.9	3522.2	4518.0	4882.6	5198.6	6541.3	8471.3	12107.0	13021.4	15120.9	16456.4	19107.7	27319.0
- India	97.6	206.7	249.3	199.9	198.2	308.8	630.0	439.4	980.7	995.0	1506.0	1216.1	1839.0
Total Electricity Sales	3218.5	3728.9	4767.3	5082.5	5396.7	6850.1	9101.3	12546.4	14002.1	16115.9	17962.4	20323.8	29158.1
Other Operating Revenue	245.1	283.3	316.3	350.3	384.7	354.4	410.0	549.3	650.5	746.4	841.1	905.6	1002.8
Total Operating Revenue	3463.5	4012.2	5083.6	5432.8	5781.5	7204.5	9511.3	13095.7	14652.6	16862.3	18803.6	21229.3	30160.9
Fuel	193.2	105.7	144.7	401.3	397.9	266.9	226.6	91.9	17.0	44.5	44.4	28.1	14.3
Energy Purchases	340.1	359.6	659.5	845.6	867.0	1058.9	3027.4	3987.7	4196.5	4835.7	5146.6	6106.1	12785.6
Salaries, Wages & Allowances	382.4	489.1	546.0	711.0	778.8	845.1	917.8	1009.6	1110.6	1221.7	1343.8	1478.2	1626.0
Operation & Administration	262.7	347.2	358.6	442.2	548.0	576.4	666.2	766.2	881.1	1013.3	1165.2	1340.0	1541.0
Royalty	186.8	227.0	268.8	348.9	423.4	497.4	587.6	751.8	780.2	956.0	1000.6	1073.3	1411.0
Depreciation	1296.0	1455.3	1482.2	1541.4	1995.5	1870.0	2000.0	1965.0	2627.0	3273.6	3683.6	4185.3	4693.5
Provisions	7.7	45.9	80.5	105.6	164.9	30.0	274.2	301.7	331.8	365.0	401.5	441.7	485.8
Reduction of Deferred Charges	162.0	204.5	188.7	270.1	236.8	220.0	193.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Operating Expenses	2830.9	3234.2	3729.0	4666.0	5412.4	5364.8	7893.6	8873.9	9944.2	11709.6	12785.7	14652.6	22557.2
Operating Income	632.6	778.0	1354.6	766.8	369.1	1839.7	1617.7	4221.9	4708.3	5152.7	6017.8	6576.7	7603.7
Interest	796.9	813.5	1207.5	1317.2	1141.3	1312.2	1306.7	2700.2	4226.7	4335.2	5540.0	5859.2	6591.1
Income after Interest before Tax	(164.3)	(35.5)	147.1	(550.4)	(772.3)	527.5	311.0	1521.6	481.7	817.5	477.8	717.5	1012.7
Prior Years Adjustment	(397.1)	(99.0)	(176.6)	(91.8)	(79.3)	(100.0)	(50.0)	0.0	0.0	0.0	0.0	0.0	0.0
Transferred from Revaluation Surplus	671.7	907.5	883.3	844.7	1019.1	1000.0	1000.0	983.1	1082.0	1215.0	1381.4	1568.1	1778.4
Profit before Tax	110.3	773.0	853.7	202.5	167.6	1427.5	1261.0	2504.7	1563.6	2032.5	1859.2	2285.6	2791.1
Income Tax	14.3	74.4	146.3	28.9	263.5	425.4	250.0	185.0	101.4	239.6	186.9	215.6	223.7
Net Profit/Loss after Tax	96.1	698.6	707.4	173.7	(96.0)	1002.1	1011.0	2319.8	1462.2	1792.9	1672.3	2070.0	2567.3
Self Insurance Fund	80.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Net Profit/loss after Tax less Self-insurance Fund	16.1	678.6	687.4	153.7	(116.0)	982.1	991.0	2299.8	1442.2	1772.9	1652.3	2050.0	2547.3
Net Profit/Loss	26.5	678.6	687.4	153.7	(116.0)	982.1	991.0	2299.8	1442.2	1772.9	1652.3	2050.0	2547.3
Average Net Fixed Assets in Service	14206.8	28926.0	29035.9	29262.4	30557.1	32267.4	34453.7	38513.3	56927.1	73979.9	82380.9	93122.2	103292.0
Ratios: Operating Ratio (%)	82.1	82.5	76.2	86.4	98.2	80.4	85.6	69.2	68.6	70.9	69.0	70.0	75.5
Rate of Return (%)	4.4%	2.4%	4.2%	2.5%	0.3%	4.4%	4.0%	10.5%	8.1%	6.6%	7.1%	6.8%	7.1%
Rate of Return on Historical Fixed assets	5.1	5.1	8.2	4.3	0.5	5.7	4.8	12.3	8.9	7.2	7.6	7.3	7.6

GWh = gigawatt-hour, HEP = hydroelectric plant, kWh = kilowatt hour, NEA = Nepal Electricity Authority, NRs = Nepalese rupee.

Source: Nepal Electricity Authority.

NEA's SOURCE & APPLICATION OF FUNDS
(NRs millions)

Fiscal year ending 15 July	Audited			Audited		Estimate	Forecast						
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Internal Cash Generation													
Operating Income after Tax	231.7	604.6	1031.6	646.1	105.5	1414.3	1367.7	4036.9	4606.9	4913.2	5831.0	6361.1	7380.0
Depreciation	1227.5	1454.9	1482.2	1541.4	1995.5	1870.0	2000.0	1965.0	2627.0	3273.6	3683.6	4185.3	4693.5
Reduction of Deferred Charges	321.7	204.5	188.7	270.1	236.8	220.0	193.8	0.0	0.0	0.0	0.0	0.0	0.0
Total Internal Cash Generation	1780.9	2263.9	2702.5	2457.6	2337.9	3504.3	3561.5	6001.9	7233.9	8186.7	9514.5	10546.3	12073.5
Sell of short-term Deposits	326.2	48.1	(230.6)	(68.2)	528.7	26.7	1139.3	0.0	0.0	0.0	0.0	0.0	0.0
Capital Reserve	10.3	10.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long-term Loans (Foreign)	1077.1	1729.0	2659.2	3648.6	3440.1	7475.8	10545.8	9309.6	8013.4	7443.5	5919.1	3873.3	2290.5
Equity Contribution (Foreign Component)	0.0	0.0	0.0	0.0	0.0	0.0	0.1	10.2	56.3	147.7	191.8	124.2	60.9
Equity Contr (Local Component)	1326.1	1108.8	1721.0	1371.7	1041.6	691.3	974.0	658.3	434.4	779.0	761.9	598.3	317.7
Revaluation Reserve(transfer to P&L)	671.7	907.5	883.3	844.7	1068.2	1128.8	1152.4	983.1	1082.0	1215.0	1381.4	1568.1	1778.4
Total Sources of Funds	5192.4	6068.0	7735.5	8254.5	8416.4	12826.9	17372.9	16963.0	16820.0	17772.0	17768.7	16710.2	16521.0
Capital investment													
Capital Expenditure (Foreign)	1320.6	2240.7	4542.7	3882.6	4265.5	6247.5	8590.4	7717.0	7221.7	6245.2	5734.8	3574.3	2351.4
Capital Expenditure (Local)	330.2	560.2	689.0	970.7	1066.4	2721.5	2910.9	873.5	625.2	1463.2	2017.1	1368.7	821.1
Interest During Construction	166.1	391.7	552.1	760.9	1325.0	1425.9	2162.3	1759.8	1112.3	1652.9	1030.7	1024.4	449.9
Total Capital Investment	1816.9	3192.6	5783.8	5614.2	6656.9	10394.9	13663.6	10350.3	8959.2	9361.3	8782.6	5967.4	3622.4
Revaluation Reserve	671.7	907.5	883.3	844.7	1068.2	1128.8	1152.4	983.1	1082.0	1215.0	1381.4	1568.1	1778.4
Investment in Government Bonds	126.4	16.6	103.5	97.6	78.5	0.0	0.0	2053.6	1882.0	1814.7	972.5	1810.4	2403.0
Long term Investment (Insurance)	80.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Interest Payment	796.9	813.5	1207.5	1317.2	1141.3	1312.2	1306.7	2700.2	4226.7	4335.2	5540.0	5859.2	6591.1
Amortization of Principal	588.5	193.8	154.3	201.5	462.2	256.8	298.0	622.2	1123.9	1255.8	1576.8	1708.6	1961.8
Debt Service of Deferred charges	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Debt Service	1387.4	1009.3	1363.8	1520.7	1605.6	1571.1	1606.7	3324.4	5352.6	5593.0	7118.8	7569.8	8554.9
Increase in Deferred Charges	811.6	26.7	45.1	446.1	408.5	0.0							
Changes in working capital													
Cash Increase	11.6	(69.5)	24.3	17.7	(18.2)	184.3	202.1	100.8	34.0	93.2	55.5	113.8	616.4
Other than Cash Increase	286.8	964.8	(488.3)	(306.4)	(1269.4)	(472.2)	728.2	130.9	(509.8)	(325.2)	(562.1)	(339.2)	(474.0)
Net Change	298.3	895.3	(464.0)	(288.8)	(1287.6)	(287.9)	930.3	231.6	(475.8)	(232.0)	(506.6)	(225.4)	142.4
Total Applications of Funds	5192.4	6068.0	7735.5	8254.6	8416.5	12826.9	17372.9	16963.0	16820.0	17772.0	17768.7	16710.2	16521.0
Times Debt Service Coverage Ratios	1.3	2.2	2.0	1.6	1.5	2.2	2.2	1.8	1.4	1.5	1.3	1.4	1.4
Annual Investment (including IDC)	1816.9	3192.6	5783.8	5614.2	6656.9	10394.9	13663.6	10350.3	8959.2	9361.3	8782.6	5967.4	3622.4
3 -Year Average Investment	2461.8	3597.8	4863.5	6018.3	7555.3	10238.5	11469.6	10991.0	9556.9	9034.4	8037.1	6124.1	4794.9
Self financing(%)													
On Annual Investment (including IDC)	35.6	11.9	34.3	27.1	34.4	26.0	8.8	24.4	26.5	31.0	33.5	55.2	109.7
On 3-year average Investment (including IDC)	0.3	0.1	0.4	0.2	0.3	0.3	0.1	0.2	0.2	0.3	0.4	0.5	0.8
Local Component (including IDC)	0.9	0.4	1.5	0.9	1.0	0.8	0.3	0.8	1.0	1.1	1.0	1.5	2.2
Debt Service Coverage (including IDC)	1.3	2.2	2.0	1.6	1.5	2.2	2.2	1.8	1.4	1.5	1.3	1.4	1.4

IDC = interest and service charges during construction, NEA = Nepal Electricity Authority, P&L = profit and loss.

Source: Nepal Electricity Authority.

TECHNICAL ASSISTANCE COMPLETION REPORT

Division: SAEN

TA No. and Name TA 2614-NEP: Power System Master Plan for Nepal			Amount Approved: \$600,000	
			Revised Amount:	
Executing Agency: Nepal Electricity Authority (NEA)		Source of Funding: ADB	TA Amount Undisbursed \$3,097	TA Amount Utilized \$596,903
Date			Closing Date	
Approval	Signing	Fielding of Consultants	Original	Actual
23 July 1996	10 April 1997	4 August 1997	April 1998	August 1998
Description				
<p>The TA was incorporated into the Project to enable a new power system master plan for Nepal to be prepared, with particular emphasis on generation planning. Several new plants were under construction or committed for development up to FY2003. The TA was to examine the period after FY2003 and the new generation capacity that would be needed.</p>				
Objectives and Scope				
<p>The TA had two objectives: (i) prepare a new power system master plan for Nepal, including a new load forecast, generation expansion plan, and transmission master plan; and (ii) conduct on-the-job training of the engineering staff of NEA in power system planning.</p>				
Evaluation of Inputs				
<p>The consultant's input for the study totaled 32.4 person-months. The final Summary Report was submitted in August 1998. The draft Transmission Master Plan report, the draft Summary Report, the Generation Expansion Plan Report, and the Long Run Marginal Cost Report were reviewed at a Tripartite meeting in July 1998. As the consultants had to redo a considerable amount of the work in connection with the generation expansion plan report, the performance of the TA consultants is rated as partially satisfactory.</p>				
Evaluation of Outputs				
<p>The consultants were to produce four major reports: (i) a load forecast report, (ii) a draft generation expansion plan (iii) a report on the long run marginal costs of power supply, and (iii) a transmission master plan and final report. The draft generation expansion plan prepared by the consultants had a number of serious deficiencies and required substantial revision. One of the most serious problems was in the consultants' assessment of the prospects for exporting surplus hydroelectric power to India. Numerous problems were identified in the consultants report and many changes were required. Most of the misunderstandings by the consultants were the result of inadequate dialogue between the consultant and the staff of NEA as well as other consultants working in Nepal on other hydro projects. The final report of the consultants, however, was completed to a satisfactory standard. A large cost overrun was incurred, much of which the consultants agreed to absorb. The second part of the TA, training of engineering staff of NEA, was finalized and approved by ADB on 21 August 1998. Study tours were conducted in India and Thailand for two of NEA's planning engineers at a cost of \$34,758.</p>				
Overall Assessment and Rating				
<p>The consultants did not communicate well with counterpart staff and were not willing to integrate the NEA staff into the study. As a result, the consultants did not understand all of the project components and the Nepal power system very well, and many assumptions they made were not justified. In most cases, these could have been confirmed or corrected through discussions with counterpart staff. However, these problems were discovered only after each draft of the final task reports were prepared and reviewed, which resulted in a substantial amount of work being redone. The final report eventually was completed to a satisfactory standard. The overall rating of the TA is partially satisfactory.</p>				
Major Lessons Learned				
<p>ADB learned from this TA that a closer integration of consultant staff and counterpart NEA staff is necessary to enable the study to progress efficiently, as most of the problems of the TA were the result of the consultants being unwilling to involve NEA staff in carrying out the study or discussing assumptions and results with NEA.</p>				
Recommendations and Follow-Up Actions				
<p>It is recommended that in future TAs for NEA that the ADB ensure a close coordination between the consultants and NEA in order that the studies can be carried out efficiently.</p>				

Prepared by Chong Chi NaiDesignation Senior Energy Specialist, SAEN

ECONOMIC ANALYSIS

A. General

1. The economic evaluation of the Project used methodology and assumptions that follow those used at appraisal. The economic analysis compared scenarios “with” and “without” the project components. Without the Project, the supply of power, which was already weak, would have continued to deteriorate. With the Project, the improved and increased power supply will benefit directly the current and future residential, industrial, commercial, and agricultural consumers. Nepal, as a whole, will benefit through the economic development that a reliable power supply brings. Other benefits include increased employment during construction, operation, and maintenance.

2. The economic analysis was conducted using 2003 world prices. The Manufacturing Unit Value Index (MUV), published by the International Monetary Fund, was used for converting costs and benefits into 2003 prices. The costs and benefits of the non-traded components were converted to the world price numeraire by using a standard conversion factor of 0.90 and expressed in 2003 constant prices.

B. Costs

3. The main project costs were capital costs of equipment, civil works, and acquisition, as well as incremental operating and maintenance costs, generation cost, and distribution cost. The economic cost of capital and incremental operating and maintenance costs were estimated from financial costs, including physical contingencies. Price escalation, interest during construction, and taxes are excluded. Annual operation and maintenance (O&M) costs have been based on the information collected from the Nepal Electricity Authority (NEA). Costs for O&M and transmission and distribution have been derived from the financial costs. The actual O&M costs were not available for the Project, as the power plant has been in operation since May 2002 and the available data during the defects liability period (from May 2002 to May 2003) was not representative of true O&M costs. O&M costs for the Project, therefore, were based on NEA’s O&M costs on other projects throughout Nepal. O&M costs have been estimated roughly as 0.8% of capital costs.³⁴ In a similar way, transmission and distribution (T&D) costs were estimated at 0.5% of the capital cost for transmission, and 2% of the capital cost for distribution.³⁵

C. Benefits

4. The analysis of the benefits of the Project used the same assumptions as at appraisal,³⁶ updated by the most recently available data and prices. The economic benefits of electricity consumption for each major consumer category were based on (i) the alternative economic costs of other energy sources, such as kerosene lighting or diesel generator sets, that were displaced by using electricity; and (ii) valuing additional or induced energy consumption at the estimated average willingness to pay for electricity, based on a weighted average of the alternative costs of providing similar energy-related services and the current electricity tariff. Three main consumer categories were examined: residential, industrial, and commercial.

³⁴ Data provided by NEA

³⁵ These percentages have been based on other recent PCRs (ADB. 2002. *Project Completion Report for the Second North Madras Power Project in India*. Manila. —2003. *Project Completion Report for the Eighth Power Project in Bangladesh*. Manila.

³⁶ ADB. 1996. *Kali Gandaki "A" Hydroelectric Project*. Manila.

Resource cost savings for domestic consumers was based on savings in kerosene lighting; resource savings for commercial and industrial consumers was based on savings in diesel-generated power. The resulting average value of residential power consumption, which accounts for 40% of NEA's energy sales, was estimated to be \$0.182 per kilowatt-hour (kWh). The average economic value of industrial power consumption, which accounts for 41% of NEA's energy sales, was \$0.154/kWh. Finally, the average economic value of power consumption for commercial users, who represent about 19% of NEA's energy sales, was estimated to be \$0.215/kWh. The average weighted tariff for these three consumer groups was \$0.177/kWh.

D. Results of Economic Analysis

5. The economic internal rate of return (EIRR) of the Project was calculated for a project life of 50 years from the completion of the project. The EIRR of the Project was estimated to be 18.2%. When compared to the opportunity cost of capital of 12%, the recalculated EIRR shows that the Project is economically feasible. The recalculated EIRR of 18.2% was higher than that calculated at appraisal (15.0%) because the capital cost to implement the project was reduced from the initial estimate, even though the period of implementation was longer.

Table A11: Economic Internal Rate of Return
(Costs and Revenues in US\$ million in 2003 Constant Price)

Year	Capital Cost	T & D Cost	O & M Cost	Total Cost	Net Sales GWh	Benefits	Net Cash Flow
1997	43.9			43.9			(43.9)
1998	35.2			35.2			(35.2)
1999	41.4			41.4			(41.4)
2000	70.8			70.8			(70.8)
2001	50.7			50.7			(50.7)
2002	16.8			16.8			(16.8)
2003	2.9	6.5	2.0	11.4	430.0	59.2	47.8
2004		6.5	2.0	8.5	477.0	66.8	58.3
2005		6.5	2.0	8.5	530.0	75.7	67.2
2006		6.5	2.0	8.5	588.0	85.8	77.3
2007		6.5	2.0	8.5	657.0	98.5	90.0
2008		6.5	2.0	8.5	657.0	98.5	90.0
2009		6.5	2.0	8.5	657.0	98.5	90.0
2010		6.5	2.0	8.5	657.0	98.5	90.0
2011		6.5	2.0	8.5	657.0	98.5	90.0
2012		6.5	2.0	8.5	657.0	98.5	90.0
2013		6.5	2.0	8.5	657.0	98.5	90.0
2014		6.5	2.0	8.5	657.0	98.5	90.0
2015		6.5	2.0	8.5	657.0	98.5	90.0
2016		6.5	2.0	8.5	657.0	98.5	90.0
2017		6.5	2.0	8.5	657.0	98.5	90.0
2018		6.5	2.0	8.5	657.0	98.5	90.0
2019		6.5	2.0	8.5	657.0	98.5	90.0
2020		6.5	2.0	8.5	657.0	98.5	90.0
2021		6.5	2.0	8.5	657.0	98.5	90.0
2022		6.5	2.0	8.5	657.0	98.5	90.0

Year	Capital Cost	T & D Cost	O & M Cost	Total Cost	Net Sales GWh	Benefits	Net Cash Flow
2023		6.5	2.0	8.5	657.0	98.5	90.0
2024		6.5	2.0	8.5	657.0	98.5	90.0
2025		6.5	2.0	8.5	657.0	98.5	90.0
2026		6.5	2.0	8.5	657.0	98.5	90.0
2027		6.5	2.0	8.5	657.0	98.5	90.0
2028		6.5	2.0	8.5	657.0	98.5	90.0
2029		6.5	2.0	8.5	657.0	98.5	90.0
2030		6.5	2.0	8.5	657.0	98.5	90.0
2031		6.5	2.0	8.5	657.0	98.5	90.0
2032		6.5	2.0	8.5	657.0	98.5	90.0
2033		6.5	2.0	8.5	657.0	98.5	90.0
2034		6.5	2.0	8.5	657.0	98.5	90.0
2035		6.5	2.0	8.5	657.0	98.5	90.0
2036		6.5	2.0	8.5	657.0	98.5	90.0
2037		6.5	2.0	8.5	657.0	98.5	90.0
2038		6.5	2.0	8.5	657.0	98.5	90.0
2039		6.5	2.0	8.5	657.0	98.5	90.0
2040		6.5	2.0	8.5	657.0	98.5	90.0
2041		6.5	2.0	8.5	657.0	98.5	90.0
2042		6.5	2.0	8.5	657.0	98.5	90.0
2043		6.5	2.0	8.5	657.0	98.5	90.0
2044		6.5	2.0	8.5	657.0	98.5	90.0
2045		6.5	2.0	8.5	657.0	98.5	90.0
2046		6.5	2.0	8.5	657.0	98.5	90.0
2047		6.5	2.0	8.5	657.0	98.5	90.0
2048		6.5	2.0	8.5	657.0	98.5	90.0
2049		6.5	2.0	8.5	657.0	98.5	90.0
2050		6.5	2.0	8.5	657.0	98.5	90.0
2051		6.5	2.0	8.5	657.0	98.5	90.0
2052		6.5	2.0	8.5	657.0	98.5	90.0
2053		6.5	2.0	8.5	657.0	98.5	90.0

Economic Internal Rate of Return 18.2%

GWh = gigawatt hour, O&M = operation and maintenance, T&D = transmission and distribution.
Source: Nepal Electricity Authority and ADB.

FINANCIAL ANALYSIS

A. General

1. The methodology and assumptions adopted for the financial evaluation of the Project generally followed those used at appraisal. The Project was reevaluated for a period of 50 years, which was the life of the Project assumed in the evaluation at appraisal. All costs and benefits in the analyses were based on constant 2003 prices. The Manufacturing Unit Value Index (MUV), published by the International Monetary Fund was used for converting costs and benefits into 2003 prices.

2. Project sustainability was assessed by comparing the weighted average cost of capital (WACC) to the financial internal rate of return (FIRR) calculated for the Project. The WACC was estimated to be 5.4%.³⁷ The analysis was undertaken over a 50-year period from completion of the Project. The FIRR for the Project was compared to the financial opportunity cost of capital.

B. Costs

3. The main project costs were based on the actual costs up to project completion. The main project costs included land acquisition, civil works, equipment, incremental operating and maintenance costs, generation costs and distribution cost. Taxes and duties were included, but interest during construction was excluded. Actual operation and maintenance (O&M) costs were not available at the project site. Because the Project has been maintained for the past year under the defects liability period of the contractor, the O&M costs were not representative of the true O&M costs. The O&M costs for the Project, therefore, were based on the O&M costs on other Nepal Electricity Authority (NEA) projects throughout Nepal. O&M costs have been estimated roughly at 0.8% of total capital costs.³⁸ In a similar way, transmission and distribution costs were estimated at 0.5% of the capital cost for transmission, and 2% of the capital cost for distribution.³⁹

C. Financial Benefits

4. The financial benefits for the Project were measured on the basis of incremental electricity volumes made possible by the expansion of the generation facilities. Benefits were estimated by multiplying the incremental sales by the annual average tariff revenue per kilowatt-hour (kWh) for 2003.

5. The estimate of the financial benefits followed the methodology and assumptions adopted at appraisal. The benefits from incremental sales were valued in terms of the annual average tariff revenue per kWh. These have been calculated for three main categories of consumer: residential, industrial, and commercial. The market shares of total energy sold for these consumer groups were 40%, 41%, and 19%, respectively. The average tariff for residential consumers was \$0.090/kWh; for industrial consumers was \$0.120/kWh; and for

³⁷ The Project was financed 71% by debt with an interest rate of 10.25%, which was the relending rate from the Government of Nepal to NEA, i.e. 4.25% in real terms, after allowing for annual inflation of 6%. The remaining 29% was financed from internal generated funds, which were assumed to have a return in real terms of 8.25%, i.e. 4% above the cost of debt. The weighted average of capital (WACC) for the Project works out to be 5.4% in real terms.

³⁸ Data provided by NEA

³⁹ These percentages have been based on other recent PCRs (ADB. 2002. *Project Completion Report on the Second North Madras Power Project in India*. Manila.
—2003. *Project Completion Report on the Eighth Power Project in Bangladesh*. Manila.

commercial consumers was \$0.153/kWh. The average weighted tariff for these three consumer groups was \$0.114/kWh.

6. The Project has a design capacity to produce 842 gigawatt-hours (GWh) per year. This capacity will be reached in about 5 years.⁴⁰ After 5 years, an estimated 717 GWh/year of generation from the Project will be firm power used to support load growth in Nepal, and the balance of about 125 GWh/year will be secondary or surplus generation, available for exports to India. Firm gross power supply for load growth in Nepal was reduced by 25%⁴¹ for estimated system losses, and the resulting energy sales were then valued at the average tariff rates. Power exports are currently priced at a tariff of \$0.058/kWh. However, India's willingness to purchase large quantities of surplus hydropower available only during off-peak periods at this tariff is not certain. Moreover, the transmission capacity to export this surplus generation to India may also constrain total exports. In view of these uncertainties, the analysis assumed that the average export revenue would be half of the maximum potential, which is equivalent to an average export tariff of \$0.029/kWh.⁴²

E. FIRR

7. The FIRR for the Project was estimated at 12.6%. The financial net present value (FNPV), discounted at the WACC, was \$420.80 million. Since the Project had an FIRR greater than the WACC of 5.4%, it is financially viable. The FIRR of the Project is shown in Table A11.1. The recalculated FIRR of 12.6% was higher than that at appraisal (9.8%) because the capital cost to implement the Project was reduced from the initial estimate, even though the period of implementation was longer.

⁴⁰ In the first year of operation (2002–2003), the plant produced about 580 GWh. Using a growth rate of 11.5% per annum, which is the rate of sales growth in Nepal over the past few years, the plant should reach its potential in about 5 years.

⁴¹ System losses in 2002 were about 24%. Although these should be reduced by NEA to 22%, as per the loan covenants, little success has been demonstrated over the past few years in doing so. The evaluation has taken a conservative view that these system losses will continue at 25%.

⁴² This is the same assumption used at appraisal.

Table A12: Financial Internal Rate of Return
 (Costs and Revenues in US\$ million in 2003 Constant Price)

Year	Capital Cost	T & D Cost	O & M Cost	Total Cost	Net Sales GWh	Revenue	Net Cash Flow
1997	45.7			45.7			(45.7)
1998	37.1			37.1			(37.1)
1999	44.1			44.1			(44.1)
2000	74.3			74.3			(74.3)
2001	53.6			53.6			(53.6)
2002	17.6			17.6			(17.6)
2003	9.7	7.1	2.1	18.9	430.0	39.5	20.6
2004		7.1	2.1	9.2	477.0	44.4	35.2
2005		7.1	2.1	9.2	530.0	50.1	40.9
2006		7.1	2.1	9.2	588.0	56.7	47.5
2007		7.1	2.1	9.2	657.0	64.9	55.7
2008		7.1	2.1	9.2	657.0	64.9	55.7
2009		7.1	2.1	9.2	657.0	64.9	55.7
2010		7.1	2.1	9.2	657.0	64.9	55.7
2011		7.1	2.1	9.2	657.0	64.9	55.7
2012		7.1	2.1	9.2	657.0	64.9	55.7
2013		7.1	2.1	9.2	657.0	64.9	55.7
2014		7.1	2.1	9.2	657.0	64.9	55.7
2015		7.1	2.1	9.2	657.0	64.9	55.7
2016		7.1	2.1	9.2	657.0	64.9	55.7
2017		7.1	2.1	9.2	657.0	64.9	55.7
2018		7.1	2.1	9.2	657.0	64.9	55.7
2019		7.1	2.1	9.2	657.0	64.9	55.7
2020		7.1	2.1	9.2	657.0	64.9	55.7
2021		7.1	2.1	9.2	657.0	64.9	55.7
2022		7.1	2.1	9.2	657.0	64.9	55.7
2023		7.1	2.1	9.2	657.0	64.9	55.7
2024		7.1	2.1	9.2	657.0	64.9	55.7
2025		7.1	2.1	9.2	657.0	64.9	55.7
2026		7.1	2.1	9.2	657.0	64.9	55.7
2027		7.1	2.1	9.2	657.0	64.9	55.7
2028		7.1	2.1	9.2	657.0	64.9	55.7
2029		7.1	2.1	9.2	657.0	64.9	55.7
2030		7.1	2.1	9.2	657.0	64.9	55.7
2031		7.1	2.1	9.2	657.0	64.9	55.7
2032		7.1	2.1	9.2	657.0	64.9	55.7
2033		7.1	2.1	9.2	657.0	64.9	55.7
2034		7.1	2.1	9.2	657.0	64.9	55.7
2035		7.1	2.1	9.2	657.0	64.9	55.7
2036		7.1	2.1	9.2	657.0	64.9	55.7
2037		7.1	2.1	9.2	657.0	64.9	55.7
2038		7.1	2.1	9.2	657.0	64.9	55.7
2039		7.1	2.1	9.2	657.0	64.9	55.7

Year	Capital Cost	T & D Cost	O & M Cost	Total Cost	Net Sales GWh	Revenue	Net Cash Flow
2040		7.1	2.1	9.2	657.0	64.9	55.7
2041		7.1	2.1	9.2	657.0	64.9	55.7
2042		7.1	2.1	9.2	657.0	64.9	55.7
2043		7.1	2.1	9.2	657.0	64.9	55.7
2044		7.1	2.1	9.2	657.0	64.9	55.7
2045		7.1	2.1	9.2	657.0	64.9	55.7
2046		7.1	2.1	9.2	657.0	64.9	55.7
2047		7.1	2.1	9.2	657.0	64.9	55.7
2048		7.1	2.1	9.2	657.0	64.9	55.7
2049		7.1	2.1	9.2	657.0	64.9	55.7
2050		7.1	2.1	9.2	657.0	64.9	55.7
2051		7.1	2.1	9.2	657.0	64.9	55.7
2052		7.1	2.1	9.2	657.0	64.9	55.7
2053		7.1	2.1	9.2	657.0	64.9	55.7
Financial Internal Rate of Return							12.6%

GWh = gigawatt hour, O&M = operation and maintenance, T&D = transmission and distribution.
Source: Nepal Electricity Authority and ADB.

ENVIRONMENTAL AND SOCIOCULTURAL IMPACTS

1. The environmental and sociocultural impacts are based on the findings of the post-construction audit study⁴³ that the Environmental and Social Studies Department (ESSD) of the Nepal Electricity Authority (NEA) carried out in April 2003 in conjunction with the Ministry of Population and Environment. The post-construction audit study findings were updated by field findings from the September 2003 Special Loan Administration Mission and the January 2004 Project Completion Review (PCR) Mission.

A. Environmental Issues

2. The Kali Gandaki Environmental Management Unit (KGEMU), established as a subcontract under the project implementation consultants, monitored the implementation of the environmental and social impacts and mitigating measures during construction. A two-member international panel of experts⁴⁴ trained the KGEMU staff in social and environmental aspects, and regularly conducted field visits to verify the KGEMU reports. The panel also advised NEA and the consultants on critical aspects of the implementation of the mitigating measures. The mitigating measures were integrated into the tender documents and specifications of civil works contract packages. Thus, Impregilo S.p.A. of Italy, the civil works contractor, had the main responsibility for implementing the mitigating measures with supervision from the consultants. The consultants certified and reported to NEA and the Asian Development Bank (ADB) the progress and completion of the implementation of the mitigating measures, together with the overall progress of the Project.

3. The project impacts during construction were normally short-term and difficult to verify once construction had been completed. The implementation of mitigating measures during construction was documented (i) by photographs, (ii) by quantitative measurements of the air, water, and noise quality, (iii) in regular reports by KGEMU through the consultants, and (iv) by field visits, reviews, and reports by the panel. In addition, ADB fielded regular missions to review the overall implementation of the Project, including the implementation of the mitigating measures.

4. Almost 75% of the mitigating measures required during construction were complied with. However, the contractor partially complied with 13% and did not comply with 12%, as reported by KGEMU.⁴⁵ The reasons for the partial compliance of the contractor with some mitigating measures were (i) late submission of the muck disposal plan; (ii) insufficient provision of toilets and sanitation facilities at construction sites; (iii) failure to request approval from KGEMU for the removal of the topsoil; (iv) failure to submit tree counts or plans for tree felling during 1997–1999; and (v) not fully restoring land that was leased temporarily. The reasons that the contractor did not comply with some mitigating measures were (i) failure to submit photo documentation of the pre-construction condition; (ii) dumping some spoils outside authorized areas; (iii) lack of provision of its own monitoring staff; (iv) discharging wastewater from the concrete batching plant directly into the river; (v) failure to maintain records on the hazardous and toxic wastes; (vi) no flagging of spring and water supply; and (vi) lax control on workers fishing in the river.

⁴³ NEA. 2003. *Post-Construction Environmental Impact Audit Study*. ADB received a copy of the final report on 26 February 2004.

⁴⁴ The September 2003 Special Loan Administration Mission consulted separately with Dr. Donald Graybill, environmental expert, and Professor Michael Cernea, social and resettlement expert, via teleconferencing.

⁴⁵ KGEMU and Morrison Knudsen International, Annual Report 2000 on the Environmental and Social Aspects of the Kali Gandaki Project.

5. In spite of the rigorous review and enforcement of the mitigating measures for construction activities, NEA has not addressed satisfactorily a number of environmental concerns. The major concerns are (i) the disposal of surplus construction materials and solid wastes, some of which could be considered hazardous or potentially hazardous; (ii) trapping and hauling of fish; and (iii) sustainable operation of the fish hatchery.

6. As recommended during the September 2003 Special Loan Administration Mission, contaminated soil must be properly removed, stored in the empty barrels, and placed in a secure place until a toxic and hazardous waste facility is operational in Nepal. Containers used to pack non-toxic and non-hazardous substances are best sold at auction or buried in a landfill with plastic materials and used tires. The landfill and secure storage area must be properly marked, fenced, and posted with appropriate warning signs. The PCR Mission was informed that NEA had initiated actions to address the safe disposal of surplus construction materials and solid wastes.

7. Fish trapping and hauling was attempted in 1998, but capturing the fish proved to be difficult and generally impractical during construction. It was not tried again on a large scale due to high water discharges. However, this is no longer the case during the operation of the dam in the dry season, when the water flow rate just downstream of the dam is limited to 4 cubic meters per second (m^3/sec) and occasionally to $6 \text{ m}^3/\text{sec}$.

8. NEA agreed to call for tenders to operate the fish hatchery and fish trapping with performance targets. NEA also agreed to engage its ESSD to monitor the operation of the fish hatchery and fish trapping and hauling program.

B. Land Acquisition and Resettlement Issues

9. The KGEMU Synthesis Report of 2001 identified 1,468 project-affected families (PAFs). As noted in the September 2003 Mission, considerable benefits accrued to PAFs during the “boom” phase of construction. Their incomes rose, along with their aspirations and lifestyles. During the construction phase, the local employment ratio was 50%, with 4,500 local laborers employed. In addition, the Project provided facilities and support to the PAFs on a goodwill basis. Some of these included renovation of the local temple, community water supply, and a school for the Bote⁴⁶ children. Skills training and microcredit also was provided. To date, about 3,000 households near the Project have received electricity as part of NEA’s rural electrification program.

10. Some PAFs are likely to have restored and improved their living standards on a sustainable basis, while others are likely to experience a decline in incomes in the absence of sustainable livelihoods. NEA needs to urgently reassess the social and economic status of all PAFs. By resurrecting the microcredit facility that was managed by the Agricultural Development Bank of Nepal, NEA should carry out a program for sustainable livelihoods for those PAFs found to be at risk of advancing income loss. The PCR Mission was pleased to note that NEA had prepared terms of reference to engage its ESSD to carry out such a reassessment. NEA also will try to employ as many PAFs as possible during the post-construction phase. NEA now employs about 225 project-affected persons.

11. A small community of Bote people in Andhimuhan village—seven families by the Andhi Khola riverbank and 10 families on the Impregilo workshop site—were seriously affected. Three

⁴⁶ The Bote are tribal fishermen on the lowest social level and represent the “poorest of the poor.”

Bote families had to relocate twice, once from the access road and later when they relocated for the Impregilo workshop. One Bote family lost land to the access road and reservoir. The post-construction audit study found that the Project "...has had mixed impact (both beneficial and adverse) on the traditional livelihoods and lifestyles of the Bote community..." The Bote people depend on traditional fishing, ferrying people across the river in small boats, and working as wage laborers for their livelihoods. They were adversely affected by the damming of the river, which reduced fish density, and the permanent infrastructure constructed for crossing the river. However, the Project also created new opportunities for boating on the reservoir up to Seti Beni holy site, involvement in fish culture, and long-term employment opportunities in the fish hatchery. NEA must continue to give the affected Bote families equal access to exploit these new opportunities. NEA built houses with electricity connections for the seven Bote families resettled from the Andhi Khola riverbank. NEA and Impregilo agreed to build houses for the 10 Bote families on the site previously used by Impregilo for its workshop. Impregilo completed its four houses in January 2004 while the remaining six houses, financed by NEA, are expected to be completed by June 2004.

12. To date, four Bote persons are operating the boats and four Bote persons are employed in the hatchery. NEA recognizes that reservoir transportation has the potential to be an important contributor to income restoration, and is currently working with authorities concerned to develop appropriate mechanisms for regulating transportation and ensuring seriously project-affected families (SPAFs) such as the Bote people have equal access to operate boats. NEA will discuss with the Agricultural Development Bank of Nepal the restoration of a microcredit facility to enable SPAFs and PAFs to purchase boats, rather than be employees of wealthier local residents. Appropriate regulatory measures, including safety standards, should be developed by the authorities concerned.

13. During the public consultation meeting on 15 January 2004 held by the PCR Mission at the Sri Birenda Secondary School, participants expressed their continued support for the Project. However, they repeated their demands that Beltari be provided with a drinking water supply and a cremation facility. In response to their first demand, the Mission explained that an ongoing ADB-financed Small Towns Water Supply Project could look into the financial and technical feasibility of providing a drinking water supply. The Mission agreed to convey their proposal for a drinking water supply to the relevant authority concerned. In response to their second demand, the Mission said it would remind NEA management to provide for the construction of a cremation facility at Beltari. Following discussions in Kathmandu, the Mission was pleased to report that NEA's managing director agreed to finance the construction of a cremation facility at Beltari.

14. The PCR Mission visited the Seti Beni Bazaar by traveling by boat along the reservoir. Seti Beni Bazaar has 90 houses with 84 families (some houses are vacant because of security concerns). Based on the floods that occurred in 1961 and in 1993, about 12 houses with 12 families could be affected by backwater flooding. If the threat of backwater flooding cannot be mitigated by operational procedures of the dam, NEA has agreed to prepare a resettlement plan in accordance with the ADB's Resettlement Policy.

QUANTITATIVE ASSESSMENT OF OVERALL PROJECT PERFORMANCE

Table A15.1: Overall Rating

Criteria	Assessment	Rating (0-3)	Weights (%)	Weighted Rating
Relevance	Highly Relevant	3	20	0.60
Efficacy	Highly Efficacious	3	25	0.75
Efficiency	Efficient	2	20	0.40
Sustainability	Likely	2	25	0.50
Institutional Development	Moderate	2	10	0.20
Overall Rating				2.45
				(Successful)

Notes:

Relevance = Project objectives and outputs were relevant to strategic objectives of the Government and the ADB.

Efficacy = Project achieved its targets and objectives.

Efficiency = Project achieved objectives in an efficient manner

Sustainability = Project benefits and development impacts are sustainable

Institutional Development = Project had beneficial impacts on government policy and institutional capacity, and other positive social impacts

Table A15.2: Rating System

Rating Value	Relevance	Efficacy	Efficiency	Sustainability	Institutional Development
3	Highly Relevant	Highly Efficacious	Highly Efficient	Most Likely	Substantial
2	Relevant	Efficacious	Efficient	Likely	Moderate
1	Partly Relevant	Less Efficacious	Less Efficient	Less Likely	Little
0	Irrelevant	Inefficacious	Inefficient	Unlikely	Negligible

Notes: > 2.5 = Highly Successful

1.6 – 2.5 = Successful

0.6 – 1.6 = Partly Successful

< 0.6 = Unsuccessful