

ASIAN DEVELOPMENT BANK

PCR: BAN 02122

PROJECT COMPLETION REPORT

ON THE

**EIGHTH POWER PROJECT
(Loan 963-BAN[SF])**

IN BANGLADESH

January 2003

CURRENCY EQUIVALENTS

Currency Unit – Taka (Tk)

		At Appraisal (31 March 1989)	At Project Completion (February 2001)
Tk 1.00	=	\$0.031	\$ 0.018
\$1.00	=	Tk 32.27	Tk 54.35

ABBREVIATIONS

BPDB	–	Bangladesh Power Development Board
DESA	–	Dhaka Electricity Supply Authority
DESCO	–	Dhaka Electric Supply Company Ltd.
DFID	–	Department for International Development
EA	–	Executing Agency
EIRR	–	economic internal rate of return
ESAC	–	Energy Sector Adjustment Credit
FIRR	–	financial internal rate of return
FMU	–	financial management upgrade
GDPDP	–	Greater Dhaka Power Distribution Project
IDC	–	interest during construction
IEE	–	initial environmental examination
IPP	–	independent power producer
IS	–	international shopping
KfW	–	Kreditanstalt fur Wiederaufbau
MOD	–	monthly operation data
NDF	–	Nordic Development Fund
ODA	–	Overseas Development Administration
PBS	–	Rural Electrification Cooperative (Palli Bidyut Samity)
PIO	–	Project Implementation Organization
REB	–	Rural Electrification Board
SCADA	–	supervisory control and data acquisition
SDR	–	special drawing rights
TA	–	Technical Assistance

WEIGHTS AND MEASURES

v (volt)	–	unit of voltage
kv (kilovolt)	–	1,000 volts
W (watt)	–	unit of active power
kW (kilowatt)	–	1,000 watts
MW (megawatt)	–	1,000,000 watts
kWh (kilowatt-hour)	–	1,000 Wh
GWh (gigawatt-hour)	–	million kWh
VA (volt-ampere)	–	unit of apparent power
MVA (megavolt-ampere)	–	million VA
Load Factor	–	ratio of average power demand to maximum power demand

NOTES

- (i) The fiscal year (FY) of the Government and its agencies ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2003 ends on 30 June 2003.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

A. Loan Identification

1.	Country	Bangladesh
2.	Loan Number	963-BAN(SF)
3.	Project Title	Eighth Power Project
4.	Borrower	People's Republic of Bangladesh
5.	Executing Agency	Bangladesh Power Development Board Dhaka Electricity Supply Authority
6.	Amount of Loan	SDR 132.677 Million (equivalent to \$165 million)
7.	Project Completion Report Number	PCR: BAN 729

B. Loan Data

1.	Appraisal	
	– Date Started	08 September 1987
	– Date Completed	17 September 1987
2.	Loan Negotiations	
	– Date Started	9 March 1988
	– Date Completed	11 March 1988
3.	Date of Board Approval	11 July 1989
4.	Date of Loan Agreement	01 September 1989 (amended on 14 September 1994)
5.	Date of Loan Effectiveness	
	– In Loan Agreement	30 November 1989
	– Actual	28 December 1989
	– Extensions (no.)	1
6.	Closing Date	
	– In Loan Agreement	31 December 1993
	– Actual	23 February 2001
	– Extensions (no.)	5
7.	Terms of Loan	
	– Interest Rate	1 % per annum
	– Maturity (no. of years)	40
	– Grace Period (no. of years)	10
8.	Terms of Relending	
	– Interest Rate	7% per annum
	– Maturity (no. of years)	25
	– Grace Period (no. of years)	5
	– Second-Step Borrower	Bangladesh Power Development Board Dhaka Electricity Supply Authority

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
26 June 1990	23 February 2001	132 mo.
Effective Date	Original Closing Date	Time Interval
28 December 1989	31 December 1993	48 mo.

b. Amount (\$ million)

Category ^a	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
01	15.794	19.814	0	19.814	19.523	.291
02	20.271	31.372	0	31.372	32.552	(1.180)
03	26.738	24.918	0	24.918	32.145	(7.227)
04	15.670	23.579	0	23.579	27.053	(3.474)
05	13.182	20.735	0	20.735	18.994	1.741
06	19.401	14.077	0	14.077	12.441	1.636
07		8.935	0	8.935	9.223	(.288)
08	29.225	0.000	0	0.000		0.000
09	2.487	2.785	0	2.785	2.785	0.000
10	22.232	3.778	0	3.778	0.000	3.778
11		1.905	0	1.905	1.099	.806
12		1.308	0	1.308	1.067	.241
13		2.557	0	2.557	5.478	(2.921)
14		4.933	0	4.933	4.853	.080
15		.739	0	.739	.015	.724
16		23.205	0	23.205	15.481	7.724
17		1.388	0	1.388	.252	1.136
Total	165.000	186.027	0	186.027	182.962	3.066

^a Category 01 = 230 kV/132 kV substations; Category 02 = 230 kV, 132kV, & 33kV overhead transmission lines; Category 03 = 11kV & 0.4 kV overhead distribution lines; Category 04 = 33 kV, 11kV, & 0.4 kV underground cables; Category 05 = supervisory control and data acquisition (SCADA) & distribution systems design equipment; Category 06 = consumer meters and services & 11kV switchgear; Category 07 = cyclone damage rehabilitation; Category 8 = local expenditures; Category 09 = service charge during construction; Category 10 = unallocated; Category 11 = engineering of Meghnaghat; Category 12 = engineering of national load dispatch center; Category 13 = financial management upgrade; Category 14 = additional materials for 6th power project; Category 15 = computer hardware and software; Category 16 = rehabilitation of power plants; Category 17 = consumer survey.

10. Local Costs (Financed)

– Amount (\$)	10.42
– Percent of Local Costs	8%
– Percent of Total Cost	3%

C. Project Data

1. Project Cost (\$ million)

Cost	Appraisal Estimate	Revised Estimate	Actual
	(Jun 1989)	(Nov 1993)	
Foreign Exchange Cost	215.4	238.4	259.4
Local Currency Cost	133.3	127.7	124.6
Total	348.7	366.1	384.0

2. Financing Plan (\$ million)

Cost	Appraisal Estimate			Revised Estimate			Actual		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
Implementation Costs									
Borrower-Financed	–	57.5	57.5	–	53.5	53.5	–	63.0	63.0
ADB-Financed	133.3	29.2	162.5	156.8	27.6	184.4	169.8	10.4	180.2
ODA (now DFID)	79.6	18.4	98.0	77.6	18.4	96.0	86.8	19.7	106.5
Subtotal	212.9	105.1	318.0	234.4	99.5	333.9	256.6	93.1	349.7
IDC Costs									
Borrower-Financed	–	28.2	28.2	–	28.2	28.2	–	31.5	31.5
ADB-Financed	2.5	–	2.5	4.0	–	4.0	2.8	–	2.8
ODA (now DFID)	–	–	–	–	–	–	–	–	–
Subtotal	2.5	28.2	30.7	4.0	28.2	32.2	2.8	31.5	34.3
Total	215.4	133.3	348.7	238.4	127.7	366.1	259.4	124.6	384.0

ADB = Asian Development Bank, ODA = Overseas Development Administration, DFID = Department for International Development, IDC = interest during construction

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

Component	Appraisal Estimate			Revised Estimate			Actual		
	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
A. Original Scope									
1. 230 kV Transmission / Substation	25.2	6.3	31.5	29.8	4.2	34.0	18.6	7.6	26.2
2. 132 kV and 33 kV Transmission/Substations	69.9	21.1	91.1	72.5	22.4	93.4	104.2	15.3	119.5
3. Distribution Facilities	78.0	18.2	96.2	80.4	12.7	92.6	92.5	29.3	121.8
4. Consulting Services and Training	4.0	—	4.0	4.0	0.8	4.8	5.3	—	5.3
5. Land Acquisition	—	2.5	2.5	—	—	—	—	—	—
6. BPDB	—	4.5	4.5	—	—	—	—	—	—
7. Taxes and Duties	—	20.8	20.8	—	36.3	36.3	—	39.4	39.4
8. Contingencies	35.8	31.7	67.5	6.0	2.0	8.0	—	—	—
9. Interest and Other Charges During Construction	2.5	28.2	30.7	4.0	28.2	32.2	2.8	31.5	34.3
B. Extended Scope									
10. Cyclone Rehabilitation				6.7	16.8	25.5	8.3	0.9	9.2
11. Rehabilitation of Khulna Station				23.8	0.7	24.5	15.2	0.2	15.5
12. Additional Materials for Loan 683-BAN(SF)				4.9	1.5	6.4	4.9	—	4.9
13. Computers and Office Equipment				0.8	—	0.8	0.1	—	0.1
14. Financial Management Upgrade (Phase 2)				2.4	0.4	2.8	5.4	—	5.4
15. Consumer Services for DESA				0.1	1.4	1.5	—	0.3	0.3
16. Engineering of Meghnaghat Project				1.8	0.2	2.0	1.1	—	1.1
17. Engineering of National Control Centre				1.2	0.1	1.3	1.0	0.1	1.1
Total	215.4	133.3	348.7	238.4	127.7	366.1	259.4	124.6	384.0

BPDB = Bangladesh Power Development Board, DESA = Dhaka Electricity Supply Authority
 Source: ADB estimates.

4. Project Schedule

Item	Appraisal Estimate	Actual
A. Original Scope		
1. Civil Works Contract		
a) Haripur Substation		
Date of Award	Dec 1989	2 May 1990
Completion of Work and Commissioning	Mar 1992	31 Dec 1993
b) Hasnabad Substation		
Date of Award	Dec 1989	2 May 1990
Completion of Work and Commissioning	Mar 1992	1 Feb 1994
2. Equipment and Supplies		
Dates		
First Procurement	Nov 1989	2 Jul 1990
Last Procurement	Sep 1990	29 Nov 1999
Completion of Equipment Installation	Dec 1992	29 Nov 1999
3. SCADA		
a) Date of Contract with Consultant	Sep 1990	20 Nov 1994
b) Completion of Work and Commissioning	Dec 1992	30 Jul 1998
B. Extended Scope		
1. Date of Contract with Consultants		
a) Rehabilitation of Khulna Thermal Power Plant	May 1994	2 Oct 1995
b) Engineering of Meghnaghat Project	May 1994	4 Sep 1995
c) Engineering of National Control Centre	May 1994	2 Oct 1995
d) Financial Management Upgrade 2	May 1994	22 Jul 1997
e) Consumer Survey for DESA	May 1994	9 Oct 1995
2. Completion of Engineering Designs		
a) Engineering of Meghnaghat Project	May 1996	30 Aug 1999
b) Engineering of National Control Centre	May 1996	15 Nov 1996
3. Completion of Work and Commissioning		
a) Financial Management Upgrade 2	Jun 1996	30 Jun 2001
b) Khulna Thermal Power Plant	Jun 1996	2 Nov 1999

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
01 Jan 91 to 31 Dec 91		B
01 Jan 92 to 31 Mar 92		B
01 Apr 92 to 31 May 92		A
01 Jan 93 to 31 Dec 93		A
01 Jan 94 to 31 Dec 94		AAA
01 Jan 95 to 31 Dec 95		AAA
01 Jan 96 to 31 Dec 96		AAA
01 Jan 97 to 31 Dec 97		AAA
01 Jan 98 to 31 Dec 98	Satisfactory	Satisfactory
01 Jan 99 to 31 Dec 99	Satisfactory	Partly Satisfactory
01 Jan 00 to 31 Dec 00	Satisfactory	Partly Satisfactory
01 Jan 01 to 23 Feb 01	Satisfactory	Partly Satisfactory

A = a delay of less than 30% in implementation progress; cost overrun not exceeding 20%; full compliance or compliance with at least 70% of major loan covenants.

B = with a delay of from 30 to 50%; cost overrun from 20 to 50%; compliance with at least 50% of major loan covenants.

D. Data on Asian Development Bank Missions

Name of Mission	Date	Persons (no.)	Person-Days ^a (no.)	Specialization of Members ^b
1. Fact Finding ^c	20–29 January 1987	3	10	a, b, g
2. Appraisal ^c	8–17 September 1987	4	10	a, b, c, g
3. Review	9–15 December 1988	1	1	a
4. Review	10–21 September 1989	2	4	a
5. Review	10–12 December 1989	3	3	a, b, f
6. Review	8–19 June 1991	1	4	a
7. Review	18–28 Nov 1991	1	3	a
8. Review	24 Feb–6 Mar 1992	2	2	a, h
9. Joint Review ^c	1–8 May 1992	1	4	a, d
10. Review	14–20 Oct 1992	2	7	a, f
11. Review	27 Jan–3 Feb 1993	1	2	a
12. Review	15–27 May 1993	2	3	a
13. Review	4–7 Nov 1993	1	4	a
14. Review	26 Feb–6 Mar 1994	1	5	a
15. Review	12–16 Jun 1995	1	2	a
16. Review	11–15 Oct 1995	1	2	a
15. Review	1–8 Nov 1996	1	3	a
16. Review	21 Jan–3 Feb 1997	4	4	a, b, h, k
17. Review	19–30 May 1997	2	4	a, f
18. Review	15–18 Jul 1997	1	5	a
19. Consultation	24 Aug–3 Sep 1997	3	3	a
20. Review	5–11 Dec 1997	1	4	a
21. Review	1–11 Mar 1998	2	4	a
22. Review	13–22 Jul 1998	1	3	a
23. Review	12–21 Jul 1999	1	3	a
24. Review	25 Oct–2 Nov 1999	2	3	a
25. Review	3–15 May 2000	3	3	a
26. Project Completion Review ^d	16–26 Sep 2002	4	11	e, h, i, j

^aFor missions that covered more than one loan, the number of person-days were estimated in accordance with the number of loans and tasks covered during the mission.

^ba = engineer, b = financial analyst, c = counsel, d = economist, e = procurement consultant or specialist, f = projects manager, g = programs officer, h = project analyst, i = consultant, j = renewable energy specialist, k = others

^cThis mission was conducted jointly with Overseas Development Administration (ODA)

^dThe project completion report was prepared by Samuel Tumiwa, renewable energy specialist and SAID mission leader, Carmencita Roque, assistant analyst, SAID; John Spurr, consultant; and Abdul Hye, consultant.

I. PROJECT DESCRIPTION

1. The Eighth Power Project was to expand facilities for electrical power transmission and distribution in greater Dhaka, Bangladesh, to meet the demand forecast until fiscal year (FY) 1994. The Project's main objectives were to (i) meet the electricity demand that was forecast for the early 1990s in greater Dhaka, (ii) reduced system losses, (iii) eliminate suppressed demand caused by inadequacies in transmission and distribution inadequacies; (iv) improve the reliability of the power supply in greater Dhaka, (v) provide system control facilities to enable continuous monitoring of power flows in the distribution system, which result in greater operational efficiency and reliability, and (vi) provide metering facilities to help reduce non-technical system losses.

2. The Project's main components were to (i) add about 110 circuit km of 230 kV transmission lines to provide power from the generating points into the 132 kV system, and to add two new 230 kV/132 kV substations; (ii) add eight new, and extend five existing, 132 kV/33 kV bulk supply substations and 220 circuit km of 132 kV power transmission lines; (iii) add nine new, and extend 22 existing, 33 kV/11 kV substations and associated 33 kV distribution facilities; (iv) extend 11 kV/0.4 kV substation facilities, including 11 kV switch gear replacement and power factor correction equipment, and extend power distribution at 11 kV and 0.4 kV; (v) upgrade system control facilities through a supervisory control and data acquisition (SCADA) system; (vi) provide consumer service facilities and metering; and (vii) provide ancillary equipment (vehicles and boats) and computing facilities for the planning of power distribution.

3. In September 1993, because of appreciation of the special drawing rights (SDR) against the dollar, the loan amount had increased from \$165.0 million to \$188.4 million.¹ The Government requested that Asian Development Bank (ADB) reallocate² \$37.7 million in savings to finance the following additional components: (i) rehabilitation of the Khulna thermal power station, (ii) procurement of additional power distribution line materials needed for Loan No. 683-BAN(SF) [Sixth Power Project], (iii) procurement of computers and office equipment to support Phase 1 of the proposed technical assistance (TA) for Financial Management Upgrade (FMU) of the Bangladesh Power Development Board (BPDB) and the Dhaka Electricity Supply Authority (DESA), (iv) finance Phase 2 of FMU, (v) finance a survey of consumer services for DESA, (vi) provide engineering of the 300 megawatt (MW) Meghnaghat combined cycle power project, and (vii) provide engineering of the National Load Dispatch Center.

4. Also provided was a TA grant of \$1 million for Phase 1 of the FMU for BPDB and DESA to implement an appropriate system for financial management and accounting, in accordance with modern practices of electric power utilities, and to train staff to improve their capabilities to operate these systems efficiently.

¹ SDR 1 = US\$ 1.24 during loan negotiations

SDR 1 = US\$ 1.42 for the period 15-30 September 1993

² Asian Development Bank (ADB) 1994. *Eighth Power Project Request by Borrower for Changes in Scope and Implementation Arrangements, Reallocation of Loan Proceeds and Utilization of Surplus Loan Funds, and Technical Assistance to Bangladesh for Financial Management Upgrade of Bangladesh Power Development Board and Dhaka Electric Supply Authority* Manila.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation of Project Amendment

5. In 1974, BPDB began to plan the Greater Dhaka Power Distribution Project (GDPDP) to expand the transmission and distribution facilities. Phase I and IA of the GDPDP were implemented from 1976 to 1985, with funding from UK's Department for International Development (DFID) (then titled the Overseas Development Administration, or ODA). These initiatives enhanced the security of the power supply considerably by building a 132 kV power transmission ring around Dhaka, establishing two additional 132 kV/33 kV bulk supply substations, and upgrading the 33 kV, 11kV, and 0.4 kV power sub-transmission and distribution networks. As a result, 589 MVA of 132 kV/33 kV power transformer capacity became available to serve the distribution system. Phase II of the GDPDP began in 1983 with ADB and DFID funding, and was completed in 1988. Phase II provided: (i) an additional 132 kV/33 kV bulk supply substation, (ii) increased transformer capacities at five 132 kV/33 kV substations, adding 132 kV transmission lines, including a second circuit of the 132 kV ring provided under Phase I, (iii) eight new 33 kV/11 kV substations, (iv) extensions of 12 existing 33 kV/11 kV substations and associated 33 kV transmission additions, (v) about 130 MVA of 11 kV/0.4 kV distribution lines, and (vi) ancillary equipment and an integrated radio communication system. The initiatives allowed the greater Dhaka area to meet increased peak electricity demand from 278 MW in 1983 to 450 MW in 1988. In 1987, DFID provided another grant for two more 132 kV substations, and a supporting 132 kV switching station, in two rapidly growing industrial and commercial areas of greater Dhaka. These facilities were implemented as Phase IIA, and completed in 1990. The Project represents Phase III of the GDPDP, and was designed to provide expanded power transmission and distribution facilities to meet greater Dhaka's forecast demand until FY1994. For Phase III, DFID also provided a grant of \$98 million equivalent to finance consulting services and training, as well as six other contract packages relating to transmission and distribution.

6. Bangladesh's power sector faced serious difficulties throughout the mid and late 1980s. To ensure sustainability of the sector entities, ADB and World Bank loans included conditionalities that required BPDB to reduce its gross system loss to an average of 32% over 3 consecutive months, and its accounts receivable to 3.5 months of billing. These conditions were monitored monthly, based on BPDB's monthly operation data (MOD). These were cross conditionalities for the Project's effectiveness, and for releasing the second tranche of the World Bank's Energy Sector Adjustment Credit (ESAC). In early 1990, BPDB reported that it had achieved the conditions over a 3-month period. Thus ADB declared the Project loan effective, and the World Bank released the second tranche of the ESAC. However, significant inaccuracies of the figures reported in early 1990 came to light when BPDB's audited FY1989 financial statements (released in June 1990) showed a 43% gross system loss against a MOD of 34% and 4.9 months of accounts receivable against a MOD figure of 3.4 months³. Given the implications of BPDB's misrepresentation of satisfying the conditionality, both ADB and the World Bank immediately requested the Government to reconcile differences in the figures between BPDB's MOD and its audited financial statements for FY1989. Both ADB and the World Bank found BPDB's reconciliation report of 15 September 1990 unacceptable.

7. ADB and the World Bank, both expressed dissatisfaction with BPDB's financial performance. In November 1990, the two major sponsors jointly decided not to process any new

³ By November 1990 the monthly operation data (MOD) on BPDB's gross system losses and accounts receivables began to deteriorate sharply. In April 1990, gross system losses were 40% and accounts receivable, 5.1 months.

loans until the Government (i) satisfied its commitment to implement agreed actions under the action plan for performance improvement prepared by ODA-financed consultants, including full commencement of DESA's commercial operations,⁴ (ii) clearly demonstrated its commitment to support the management of BPDB and DESA in establishing acceptable levels of accountability and discipline among their staffs; and (iii) implemented a comprehensive program to improve the financial management of BPDB and DESA at an estimated cost of about \$6.5 million. In December 1992, ADB organized a donor coordination meeting in Dhaka to review progress in the sector, establish criteria for resuming assistance, and discuss a medium-term strategy for improving the sector's performance. The strategy included (i) changes in the business environment through corporatization, commercialization, and increasing private sector participation,⁵ (ii) improvement of BPDB and DESA's systems of financial management,⁶ (iii) establishment of sector entities that would be run on a commercial basis to serve as role models and change agents; and (iv) enlarging the scope of the rural electrification cooperatives (*Palli Bidyut Samitis*, or (PBSs), because they were the only entities that were able to minimize their unaccounting losses, collect dues from consumers on time, and maintain a disciplined work force; (v) rehabilitate existing power plants to ensure the continuity of integrated power system operations, as well as BPDB's financial viability; and (vi) strengthening the long-term planning process in the sector by updating the power system master plan.⁷ The strategy represented a new era in donor-Government relations to move beyond financing of power infrastructure, to engage in a policy dialogue to reform the power sector. The Project was amended to use the loan savings to support sector restructuring. Appendix 1 includes a table outlining the contents of the report *Power Sector Reforms in Bangladesh*, which the Cabinet approved on 12 September 1994.

B. PROJECT OUTPUTS

1. Original Outputs

8. The system expansion of the greater Dhaka area was given high priority because it would contribute to the Government's sector objective of augmenting the commercial energy supply in areas with the greatest potential for improving economic productivity and reliability, and decreasing system losses. Specifically areas where improvement is possible include: (i) The expansion and reinforcements of the transmission network would result in improved capacity and reliability of electricity supply to existing and new consumers, and a reduced load on the existing 132 kV and 33 kV lines. That will, in turn, reduce system losses.; (ii) The distribution expansion will extend service delivery and improve quality to electricity users.; (iii) The control facilities will enable continuous monitoring of power flows into the distribution system, and will improve efficiency and reliability. (iv) Improved metering will reduce non-technical system losses.

⁴ The Dhaka Electricity Supply Authority (DESA) began commercial operations on 1 October 1991 after a 9-month delay and after the World Bank suspended disbursements under its Power Distribution (Sixteen Towns) Project (CR 2016-BD) in September 1991.

⁵ ADB 1992. *Review of Electricity Legislation and Regulations*, Manila.

⁶ The program consisted of four components: (i) appointment of an international firm of auditors,(ii) appointment of experienced and qualified financial managers,(iii) a financial management improvement program,and (iv) training. The World Bank financed items (i) and (ii); ADB, item (iii); and UNDP, item (iv).

⁷ ADB 1993. *Preparation of a Power System Master plan*, Manila.

2. Additional Components

9. Proceeds from the loan savings represented ADB's efforts to support the agreements between the Government and donor agencies on a medium-term strategy to restructure the energy sector. Specific areas include: (i) The medium-term strategy to rehabilitate existing plants, essential to ensure the continuity of operation of integrated power systems as well as BPDB's financial viability, were supported by the rehabilitation of the Khulna thermal power station; the procurement of additional power distribution line materials needed for Loan No. 683-BAN(SF): Sixth Power Project; system rehabilitation after cyclone damage; and the engineering of the National Control Center and Communication Network. (ii) The medium-term strategy objective of improving BPDB and DESA's institutional performance was supported by the TA grant for their FMU, and procurement of computers and office equipment to support it; financing of the implementation of Phase 2 of the FMU; financing of DESA's consumer survey; and meter recalibration and replacement. (iii) The engineering of the 300 MW Meghnaghat combined cycle power project was to increase private participation in the sector, and create a role model for the sector by establishing a new, commercially run company.

C. Project Costs

10. The total Project was estimated at \$348.7 million, of which \$215.4 million (about 62%) was in foreign exchange, including \$2.5 million for service charges and interest during construction; and \$133.3 million (about 38%) was in local currency costs, including duties and taxes. ADB provided a loan of \$165 million from Special Funds to finance \$135.8 million (about 63%) of the foreign exchange cost, including service charges and interest during construction, and \$29.2 million (about 22%) of the local currency costs. DFID provided a grant of \$98 million equivalent to meet the balance of the foreign exchange requirement of \$79.6 million, and \$18.4 million of the local currency cost. ADB and DFID financing amounted to \$263 million, or 75% of the total Project cost. The remaining cost of \$85.7 million equivalent was to be financed partly from BPDB and DESA's internally generated funds, and partly by the Government as equity contribution and local currency loans. During implementation, the SDR appreciated significantly against the dollar, increasing the loan amount in dollar terms from \$165.0 million to \$188.4 million.⁸ The Government requested that ADB reallocate \$37.7 million in savings from the loan to finance the additional components. Consequently, the appraisal estimate was revised to \$366.1 million equivalent, comprising \$238.4 million in foreign currency costs, and \$127.7 million in local currency.

11. The Project's actual cost was \$384.0 million equivalent, of which \$259.4 million was in foreign exchange (67.5%), and \$124.6 million equivalent in local currency (32.4%).

12. As agreed through the financing plan at appraisal, proceeds of the ADB loan were lent to BPDB and DESA at an interest rate of 7% per annum, repayable over 25 years. The agreement includes a grace period of 5 years, with BPDB and DESA assuming the foreign exchange risk.

D. Disbursements

13. Total disbursements were SDR130.34 million (\$182.96 million equivalent), compared with the approved amount of SDR132.68 (\$165.00 million). The difference of SDR2.334 million

⁸ At loan negotiation, the exchange rate was SDR1.00 = \$ 1.24. At loan closing the exchange rate was SDR1.00 = \$ 1.29.

was cancelled after the loan account was closed on 23 February 2001. Further differences in dollar terms were caused by the SDR's appreciation against the US dollar. The disbursement period envisaged during appraisal was for 4 years (1990–1993). But utilization of loan proceeds did not start until February 2001, because of delays in procurements and in Project implementation, and the change of scope in November 1993. The estimated and actual loan disbursements are compared in Appendix 2.

E. Project Schedule

14. Implementation of previous and currently ADB-financed projects with BPDB and DESA has generally been characterized by delays. (BPDB has been the Executing Agency [EA] for seven projects and DESA, three). The Project was slow in starting, and many components suffered from delays and bottlenecks in implementation. The consultancy for the original scope of the Project, which was fully financed by the DFID parallel co-financed grant, was awarded to Ewbank Preece, Ltd., UK. The DFID grant was in place before the loan was made effective, so there were no delays in recruitment of consultants. Procurement for upgrades of the original scope of work for transmission and distribution generally proceeded on time, except for procurement of line poles, and SCADA for DESA. Both delays were caused by disagreements between the consultant and DESA over whether suppliers and contractors were responsive to bid specifications. That delayed the delivery of poles by about 9 months, and SCADA by 2 years. They were: FMU for BPDB and DESA, and rehabilitation of the Khulna Power Station. Because of those delays, the loan closing date had to be changed five times (para. 24-27). Appendix 3 shows, in chronological order, major events in the Project's implementation. Appendix 4 shows the Project schedule at appraisal, and its actual schedule.

F. Implementation Arrangements

15. Project implementation was generally carried out as designed at appraisal. The People's Republic of Bangladesh was the Borrower and BPDB, a semi-autonomous body with corporate status, with the responsibility of planning, constructing and operating power generation, transmission and distribution facilities, was the initial EA. The Project initially used the existing Dhaka Phase II Project Implementation Organization (PIO) to oversee implementation. The PIO was responsible for the Project's technical, financial, and administrative control. The PIO was also responsible for procurement of equipment and services, including preparation of bid and contract documents, evaluation of bids, recommendations on the award of contracts, supervision of construction, installation and commissioning of Project facilities, and management of the personnel training program. The PIO was headed by a Project Director with the rank of Superintending Engineer who was responsible for day-to-day Project implementation and management, and who maintained liaison among BPDB, the Project consultants, ADB, and DFID. Consultants conducted the detailed engineering work and prepared technical specifications. The consultants also helped the PIO supervise the construction and commissioning of Project facilities. As anticipated during appraisal, DESA, when established, a similar PIO with the same organizational structure and responsibilities. The same consultants served both the PIOs in BPDB and DESA.

16. Under the original scope of work, the BPDB PIO oversaw the procurement, implementation, and commissioning of (i) the 110 circuit km of 230 kV transmission lines to provide power from the generating points into the 132 kV system, and addition of two new 230 kV/132 kV substations; and (ii) the addition of eight new, and extension of five existing, 132 kV/33 kV bulk supply substations, and 220 circuit km of 132 kV power transmission. Through the additional components, BPDB oversaw (i) rehabilitation of the Khulna thermal power station,

(ii) the BPDB part of the FMU, (iii) engineering of the 300 megawatt (MW) Meghnaghat combined cycle power project, and (iv) engineering of the national control center. The PIO in DESA oversaw the procurement, implementation, and commissioning of the following sub-projects of the original scope of work (SOW); (v) addition of nine new, and extension of 22 existing, 33 kV/11 kV substations and associated 33 kV distribution facilities; (vi) extension of 11 kV/0.4 kV substation facilities, including 11 kV switchgear replacement and power factor correction equipment, and extension of power distribution at 11 kV and 0.4 kV; (vii) upgrading of system control facilities through a SCADA system; (viii) consumer service facilities and metering; and (ix) ancillary equipment (vehicles and boats) and computing facilities for distribution planning. The PIO in DESA also oversaw the following subprojects of the additional components: (i) procurement of additional power distribution line materials needed for Loan No. 683-BAN(SF), Sixth Power Project (additional component), (ii) the DESA part of the FMU; and (iii) the consumer services survey.

17. The implementation arrangements were considered adequate for delivering the Project outputs. However, as with earlier projects in the sector, the PIOs were often understaffed and suffered from inefficiencies because of frequent staff turnover, especially the Project Director.

G. Conditions and Covenants

18. Appendix 5 gives the Project's major conditions and covenants, and their status of compliance.

19. The Project's main non-compliance was in BPDB and DESA's financial performance. This longstanding non-compliance was a regular feature throughout the implementation period. In hindsight, the financial covenants set at appraisal were unrealistic. Following is a summary of the financial non-compliance for FY2001 (audited):

Covenant	BPDB FY-2001	DESA FY-2001
Operating ratio to be less than 100%	109%	126%
Self-financing ratio (SFR) not to be less than 20%	SFR was negative	SFR was negative
Accounts receivable not to exceed 3 months	12.0 months	15.7 months
Debt: equity ratio not to exceed 60:40	40:60 (Complied with)	Negative equity due to accumulated losses

20. The main reasons for the financial non-compliance were high operating costs compared with average tariffs, and major problems in collecting money from customers in both public and private sector. On the positive side, however, BPDB and DESA have reduced their system losses. For BPDB, losses dropped from 25% in FY1993 to 18% in FY2001; for DESA, losses dropped from 31% in FY1993 to 26 % in FY2001.⁹

21. A significant proportion of accounts receivable were very old (as old as 10 years). Furthermore, BPDB was owed the equivalent of 17 months billings for power sold to DESA . Effective 1 January 1996, the accounts receivable covenant was revised so the public sector segment of receivables could not exceed 1 month (but the overall target of 3 months was not

⁹ These numbers are inclusive of the sales of power to REB and DESCO.

changed). The operational performance (FY1994–FY2002) and audited accounts of BPDB and DESA for FY2001 are summarized in Appendix 6.

H. Related Technical Assistance

22. A related TA grant of \$1 million, from the Japan Special Fund, was approved along with the changes in scope, to enable BPDB and DESA to implement appropriate systems for financial management and accounting, in accordance with modern electric power utility practices, and to train staff to operate these systems efficiently. The consultant's scope of work included: (i) to review current system and practices, specifically the consumer accounting system; cash collection, receipt, and reconciliation of outlying bank accounts; and collection of operational data; (ii) to identify necessary modifications of the system; and (iii) to set up pilot systems for computer-based consumer billing and commercial accounting in selected BPDB and DESA electricity supply units. Based on (i) in the scope of work was to modify and improve the internal controls for receipt and reconciliation of cash deposited in outlying bank accounts to ensure that funds are transferred rapidly, and to train BPDB and DESA staff in how to use the new system.

23. A Technical Assistance Completion Report completed in August 1997, found the new systems successful, and that BPDB and DESA sales units would spread them rapidly in Phase II. TCR commended the consultant, PA Consulting of New Zealand, for completing the design of the billing and accounting systems despite the delays in hardware procurement. The TCR evaluated the TA as successful.¹⁰

I. Consultant Recruitment and Procurement

24. The Project consultants were financed by the DFID parallel co-financed grant. The DFID grant was in place before the loan was effective, so there were no delays in recruitment of consultants. Procurement of goods and services was in accordance with ADB's *Guidelines for Procurement*. BPDB was allowed to initiate advance procurement. However, both BPDB and DESA, especially DESA, were slow in processing procurements. In addition, the Government also required BPDB and DESA to submit a substantial number of procurement decisions for approval of the Government Procurement Committee before submission to ADB for review and approval. Government approval often took 2 or 3 months. When ADB requested streamlining of the process, it was agreed that procurement decisions of BPDB and DESA would be forwarded to the government and ADB simultaneously. ADB also requested quicker turn-around of Government approval. Several procurements were also delayed significantly because of disagreements between the DESA and the consultants, and because ADB found both the quality of the bidding documents and the bid evaluation reports inadequate. Appendix 7 summarizes the ADB-financed contracts.

J. Performance of Consultants, Contractors, and Suppliers

25. For the original scope, Ewbank Preece, Ltd., was the sole consultant. DFID—not the EAs—selected and fully financed Ewbank Preece. Thus, the consultants seem to have perceived their accountability more to DFID than to BPDB and DESA. This inadequate accountability to the EAs caused difficulties in Project implementation. On several occasions the consultants disagreed significantly on selection of bids for suppliers and contractors.

¹⁰ ADB 1997. *Technical Assistance Completion Report on Financial Management Upgrade of Bangladesh Power Development Board and Dhaka Electric Supply Authority*. Manila.

Disagreement on SCADA for DESA caused a 2-year delay, and disagreement about procurement of poles for the distribution network delayed implementation for almost 1 year. Furthermore, in both cases consultants engaged in nonproductive exchanges of correspondence, and did not negotiate agreements with the EAs until sternly warned by ADB. In the case of the SCADA for DESA, ADB also found the consultant inconsistent in reviewing the bids, and in categorizing bids responsive. That, resulted in the need to re-bid the contract. Thus, the consultant's performance is considered only partially satisfactory.

26. The performances of the consultants for the engineering of the Meghnaghat power station (Ewbank Preece, Ltd.), the National Load Dispatch Center (Beca Worley International) and FMU Phase II (PA Consulting), through the sub-components of the change in scope, were satisfactory. But performance of the consultant for the rehabilitation of Khulna (Hyundai Engineering) was only partially satisfactory. Several ADB review missions found that the consultant neither appointed an on-site project manager to oversee the works, nor prepared a master schedule for the rehabilitation works. This resulted in an inability to effectively oversee the contractors, and contributed to the delay in Project implementation. The performance of the consultants retained by DESA for the consumer survey (Associated Resources Mgt. Co. and Islam Aftab & Co.) is considered unsatisfactory because data gathered were inaccurate, and DESA could not use large part of it for the billing systems.

27. The performance of the contractors and suppliers was satisfactory, with a few exceptions. In the case of FMU (Beximco and their sub-contractor PriceWaterhouseCoopers of India) a delay of almost 2 years resulted from delays in the procurement of computer equipment and software, the EA's lack of understanding of the commercial accounting and financial management system, and the resulting need to significantly customize the software. The supplier of poles for the distribution system (Geocon) delayed Project implementation significantly because manufacturing problems made it unable to deliver poles as specified in the bidding documents.

K. Performance of the Borrower and the Executing Agency

1. The Borrower

27. The Borrower showed strong commitment during Project implementation by ensuring the availability of sufficient counterpart funds to support the important infrastructure for transmission and distribution. The Borrower's responsiveness and willingness to enter into a policy dialogue on sector reforms should be highly commended. The most notable reform activities included (i) promoting private sector participation in the power sector, (ii) a commitment to the improvement of BPDB and DESA's systems of financial management systems, and (iii) the establishment of sector entities that would be run on a commercial basis to serve as role models and change agents. But, the Government's commitments to establishing a framework for the EA's viable operational and commercial performance fell short. Thus, the EAs were not able to meet their financial covenants of (i) maintaining a 20% self-financing ratio; and (ii) keeping the accounts receivable of BPDB and DESA at 3 months, with the accounts from Government entities at 1 month. Considering the importance of the financial covenants to ensure BPDB and DESA's viability and sustainability, the Borrower's is partially satisfactory.

2. The Executing Agencies

29. The EAs carried out components outlined in Section F, in accordance with the design, specifications, and construction methods envisaged at the outset, and agreed upon with ADB,

during implementation. Although the EAs achieved the Project objectives, delays in Project implementation adversely affected, somewhat, efficiency and effectiveness. Therefore, the performance of the EAs was partially satisfactory.

L. Performance of ADB

30. The performance of ADB was satisfactory. ADB cooperated well with the Borrower and EAs in formulating the Project and processing the loan. ADB's Project staff actively monitored Project activities and advised the EAs' staff on Project implementation matters. ADB's resident mission also provided considerable support in coordination with DFID during Project implementation.

31. The Borrower and the EAs were especially appreciative of ADB's flexibility in changing the scope in order to utilize loan savings, begin power sector reform, and ensure that the power sector program was relevant to Bangladesh's needs. As a result, ADB and the Government have entered into a 15-year reform time horizon, one of the longest associations with any country. ADB, as the donor coordinator to the energy sector, has supported its restructuring in accordance with the Government's plans. All major sector restructuring in Bangladesh so far has been with ADB support, and ADB has supported the restructuring with all the instruments in its armory (i.e. ADF/OCR loans, TA grants, private sector loans, commercial co-financing, export credit solicitation, staff policy advice).

III. EVALUATION OF PERFORMANCE

A. Relevance

32. The Project's rationale: to help expand power transmission and distribution facilities in greater Dhaka to meet demand forecast to FY1994 was sound. It supported the Government's sector objective of augmenting the commercial energy supply in areas with the greatest potential for increased economic productivity, and improving reliability and decreasing system losses. Without the Project, Dhaka would have suffered from insufficient electricity, constraining economic growth and development. The Project has allowed BPDB and DESA to meet Greater Dhaka's current loan demand of 1260 MW. It has improved power reliability; the hours of load shedding and power failures because of technical faults has decreased. The change in scope started the Government and ADB's policy dialogue on reforming and restructuring the power sector. Most significantly, the Project has strengthened BPDB and DESA's institutional capacity, promoted private sector participation in power, and improved delivery service of electricity.

B. Efficacy in Achievement of Purpose

33. The Project is considered successful in achieving its development objective of meeting Greater Dhaka's demand for power until the mid-1990s. Although the Project was faced with significant delays in implementation which resulted in a postponement of Project benefits, and BPDB and DESA's financial sustainability remains weak, the additional and upgraded substations, transmission lines, and distribution network are the backbone of Dhaka's power supply. Also, the additional capacity, coupled with the SCADA system, allows DESA to better manage the load, and has resulted in greatly improved reliability and quality in the system. Most importantly, the policy dialogue that resulted from the change in scope serves as the foundation for ongoing sector reform efforts in Bangladesh, which ADB must continue to push for. The additional components financed by the loan savings also contributed significantly. The

FMU of BPDB and DESA has significantly improved the billing and collection system, and allows BPDB and DESA to mine the accumulated data in order to improve service delivery. Also, greater private participation in the sector has resulted in greater generation capacity and more efficient distribution.

C. Efficiency in Achievement of Outputs and Purpose

34. The Project's efficiency is considered only partially successful because of delays in implementation. At Project appraisal, a time slice method was used to estimate the economic internal rate of return (EIRR) and the financial internal rate of return (FIRR). This choice reflected that the benefits from the Project investment could not be separated from the benefits attributable to the entire power network (generation, transmission and distribution). In re-estimating the EIRR and FIRR, the time slice method was again used because no better alternative was available. Appendix B includes the detailed EIRR and FIRR. The re-estimated EIRR is 17.30 vs. 19.6 at appraisal; the re-estimated FIRR is 3.25% vs. 9.9% at appraisal. The low re-estimated FIRR reflects that tariffs have not kept pace with increases in operating costs, and is lower than the weighted average cost of capital.

35. The SCADA system provided through the Project has played a significant role in helping DESA reduce its system losses. The FMU component has helped BPDB and DESA upgrade and improve their billing and revenue collections. Further benefits will be realized when the financial accounting system is installed and running.

36. When the Project scope was changed in 1993, an economic return was calculated for the rehabilitation of the Khulna thermal power station (a combined EIRR for the 110 MW plant and the 60 MW plant). At the Project completion stage, the EIRR for the 60 MW plant was estimated at 22%. An EIRR for the 110 MW plant has not been estimated because that plant was not rehabilitated through the Project but, instead, received minor assistance through the provision of spare parts.

D. Preliminary Assessment of Sustainability

37. Under the original scope, the transmission and distribution infrastructure and facilities that were built and expanded through the Project remains sound. With regular maintenance, they should last through the Project's economic life. But the continued lack of capacity put an extra burden on the substations and transmission and distribution network that may unduly shorten their economic lives. The SCADA system has for 2 years, and should continue to operate well. But only 4 of the 11 engineers trained on the system remain in the SCADA unit. The Government and DESA must take steps to retain trained personnel in the SCADA unit, including the provision of incentives to stay there. Also, given the relatively short shelf life of technology, DESA should commit itself to the regular maintenance and upgrading of the system. The sub-components of the change in scope have also had a broad impact on the sector. The engineering of the Meghnaghat project has resulted in its implementation and the cheapest independent power producer (IPP) in Asia. The FMU upgrade has greatly improved BPDB and DESA's billing systems. But, further assistance is needed to implement the FMU accounting system so both organizations can fully realize gains in efficiency from both the billing and financial accounting systems. The rehabilitation of Khulna is the most suspect in terms of sustainability. Renovations were completed in 2001, but the 60 MW generator has been down since 15 May 2002 because of a failure in the starter coil. BPDB is in the process of selecting a contractor to replace the coil, and expects complete rehabilitation by January 2003. Because of these problems, neither EA has been able to produce the additional capacity envisaged at the

time of the change in scope. On the reform agenda, BPDB and DESA continue to have negative self-financing ratios, and high receivables. But, the Government is continuing with the corporatization of DESA. Also, as first step to further sector reform, BPDB has submitted a proposal to the Government to run each generation facility as a separate corporate entity with its Power Purchase Agreement (PPA) and each distribution circle as a profit center, with respective service agreements.

E. Environmental, Sociocultural, and Other Impacts

38. At appraisal, the works implemented through the original scope were expected to have no significant adverse environmental effects. The transmission lines mostly passed through unbuilt areas around Dhaka. Underground cables were used where the lines had to pass through densely built areas. Implementation of the subprojects required no land acquisition, human displacement, or cutting of trees. Conservative modeling on the impacts of rehabilitation of the Khulna power station showed that ground level concentrations of oxides of nitrogen (Nox) and sulphur dioxide (SO₂) and suspended particulates, are well within both Bangladesh and International (World Bank, Germany, United States) standards.¹¹

39. The increased capacity and improved system of transmission and distribution will improve the reliability and delivery of services to consumers. For commercial and industrial users, the improvements will increase productivity and extend the life of sensitive energy consuming technologies and machineries. For household users, the improved system will allow greater use of electrical appliances and electronic devices that provide comfort, entertainment, and a more modern lifestyle.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

40. The Project is considered successful, based on a review of its relevance, efficacy, efficiency, sustainability, and impact on institutional development. Appendix 9 includes the quantitative assessment of Project performance by ADB's criteria to determine project rating.

B. Lessons Learned

41. For future ADB assistance to BPDB and DESA as EAs, the design and implementation schedule should take into account the track record of procurement delays, and ways to speed procurement. Also, ADB should ensure that future EAs fully understand its procurement processes through training and explaining the importance of timely and accurate procurement in the Project Administration Memorandum at Project inception. Delegation of powers from higher authorities to the EA is critical to both recommendations. The corporatization of DESA and the reorganization of BPDB into corporate entities and profit centers, paving the way for further restructuring, seems to be a potential solution. Another crucial lesson learned is the need to integrate the project design and implementation team, currently the PIO, with the unit that will eventually oversee day-to-day operations of the investment. Currently, the PIO oversees all project implementation. Upon completion, that responsibility will be handed over to the operating unit. This system does not allow the consultants and contractors to transfer

¹¹ In rare cases, under certain combinations of adverse weather and fuel conditions, the short-term ground level concentrations will be within the Bangladesh and USA standards, but may be below World Bank and German standards.

experience and practices to the operating unit. This was especially important in the transition of the SCADA system and the Khulna Power Station from the PIO to the operations units. Integration made the transition much smoother, such as in the FMU.

C. Recommendations

1. Project-Related

42. The power sector had a poor record of operations and maintenance, but its performance has improved significantly in recent years. Investments to increase capacity and improve reliability have been significant, so, regular monitoring of those investments is recommended. Besides monitoring the physical investments, ADB should also monitor to ensure that the human resource allocation (i.e., for SCADA and the billing and accounting systems) are adequate and, of the appropriate level, and that trained personnel stay with the units long enough run them, and train others in their use. ADB should also ensure the maintenance and periodic upgrade of the SCADA and the billing and accounting systems, given their sensitive nature and relatively short life span. This monitoring could be during the annual Country Portfolio Review, and during overall sector reviews of other ADB-financed power projects in Bangladesh.

43. Additional assistance should be provided to fully implement the financial accounting system that the FMU has designed, allowing both BPDB and DESA to fully realize their investments. The Government has already requested additional assistance from loan savings from the Dhaka Power System Upgrade Project. But, ADB should provide that assistance only if BPDB and DESA can provide the number of programmers necessary for successful Project implementation. Similarly, DESA should have more assistance for the SCADA, including the 132 kV/33 kV substations that are currently under BPDB. That will better integrate the system, and make the necessary upgrades to the 33 kV/11 kV and 11 kV switching stations so that they can be remotely controlled. ADB should provide assistance only if DESA can fully staff the SCADA center, and provide the incentives to ensure retention of qualified, SCADA-trained engineers.

44. For the short to medium-term, it is realistic to assume that BPDB and DESA will not be able to comply with two major covenants: accounts receivable not to exceed 3 months, and a self-financing ratio of no less than 20%. Indeed, BPDB and DESA are close to financial nonsustainability. Although BPDB has a chance of complying with the operating ratio target (not to exceed 100%), DESA's chances are slimmer because of its weaker financial condition. But rather than changing the covenants at this stage (which also apply to the Ninth Power and the Dhaka Power System Upgrade projects), it is recommended that improvements in BPDB and DESA's financial performance be encouraged and addressed through the ongoing reform program. Specifically, an action plan should be developed to provide a platform for improving BPDB and DESA's financial performance.

45. The extent of BPDB and DESA's financial troubles can be seen in the latest audited accounts (Appendix 6). Large net losses have accumulated over the past decade, mainly because the modest level of regular annual tariff increases fell far short of the high increases in operating costs. BPDB and DESA manage to maintain positive cash balances—but only because they keep high current liabilities, including accounts payable.

46. The action plan should cover the following basics: (i) implement the new financial accounting system; (ii) design and implement a new management information system; (iii)

prepare an age analysis of accounts receivable to separate receivables older than 3 years from recent receivables. Separation of receivables might make it possible to write off some old debts, or offset some of them against payables [e.g. between DESA and Dhaka Water and Sanitation Authority (WASA)], or to make the Government pay BPDB and DESA directly rather than giving defaulting ministries the budgetary allocations. To control costs, a hard look at discretionary operating expenses will be essential. Furthermore, commercialization or corporatization programs to address the problem of overstaffing is necessary; otherwise, control or reduction of operating costs will.

47. The investments in infrastructure for transmission and distribution have already benefited residents and businesses of Greater Dhaka. But, the full benefits of the SCADA and billing and financial accounting systems will be realized only after full implementation. Therefore, it is recommended that the Project Performance Audit Review of the entire project be carried out only after full implementation of the SCADA and billing and financial accounting systems.

2. General

48. The policy dialogue between ADB and the Government has progressed significantly since the Project's 1994 inception. It is important that the Government and its development partners hasten implementation of the power sector reforms that were formulated in 1994. The reform most needed is need to corporatize both BPDB and DESA, and give them the autonomy and distance needed to function as effective and efficient deliverers of reliable power.

POWER SECTOR REFORMS IN BANGLADESH

Power Sector Reforms in Bangladesh ¹	Progress of Reforms Initiatives Agreed with Development Partners	Assessment by Asian Development Bank (ADB)
Restructuring of Dhaka Electricity Authority (DESA) into a corporate body with an independent Board of Directors	<ul style="list-style-type: none"> The DESA Act was amended in 1998 to rationalize its boundary with the Rural Electrification Board (REB). Transfer of all outlying areas outside metropolitan Dhaka with 4,100 km of 33.0/11.0/0.415 kV lines, all substations and immovable assets completed. This transfer has increased demand in seven PBSs around Dhaka from 190 to 450 MW. The Dhaka Electric Supply Company Ltd. (DESCO) was incorporated in November 1996 with the ultimate objective of taking over all assets from DESA. DESCO commenced commercial operation on 1 September 1998 by taking over the Mirpur area from DESA. DESCO, which has a fully independent board, introduced a commercially oriented business culture with new service rules and a separate pay structure. DESCO has succeeded in reducing system loss from 43% at the time of taking over to 23% in June 2002. Billing and collections have improved substantially. The quality of consumer service has improved. Gulshan Circle of DESA is scheduled for transfer to DESCO by 2002. DESA and DESCO have initiated preparatory steps for the transfer. The Government has agreed to corporatize the remaining part of DESA. ADB will support the Government with a technical assistance grant to complete the corporatization process. 	<ul style="list-style-type: none"> Major achievement Major achievement. The highest court has upheld the Independence of the Board of Directors of DESCO. Improved performance in implementing projects. Recent recruitment of a successful general manager of a PBS as managing director will bring qualitative change in management culture of DESCO. Move in right direction Move in right direction. This will enable the Government to address the issue of surplus employees, who are reluctant to join REB and/or DESCO under the new service condition.

¹ Reforms recommended in the report "Power Sector Reforms in Bangladesh" were approved by the cabinet on 12 September 1994.

Power Sector Reforms in Bangladesh²	Progress of Reforms Initiatives Agreed with Development Partners	Assessment by Asian Development Bank (ADB)
Restructuring of Bangladesh Power Development Board (BPDB) along functional lines with separate entities for generation, transmission and distribution	<ul style="list-style-type: none"> • The Power Grid Company Ltd. of Bangladesh (PGCB) was incorporated on 21 November 1996 to take over all transmission assets of BPDB and DESA by December 2002. PGCB has already taken over 62% of the transmission assets from BPDB. DESA's transmission assets (other than those that are integral parts of DESA operations) and the remaining BPDB transmission assets, inclusive of load dispatch center, are to be transferred by December 2002. • PGCB is now responsible for construction of all new transmission assets and getting support from ADB, KfW, NDF and Denmark. • The Ashuganj Power Company was incorporated in August 2001 to take over all generation assets of the Ashuganj Power Station. ADB and KfW support the new company with technical assistance to operationalize APS. Management is being recruited. • BPDB has converted the Haripur power station to a strategic business unit (SBU). JBIC is providing technical assistance to the SBU. • BPDB corporatized its West Zone distribution. Company in September 2002. • BPDB has also initiated steps to create SBUs in other generation plants and distribution areas. 	<ul style="list-style-type: none"> • Major achievement. The total handover of transmission assets will essentially segregate BPDB's generation and distribution functions. • Major achievement. • Major achievement.
Increasing private sector participation in generation and distribution activities	<ul style="list-style-type: none"> • The Rural Power Company Ltd. (RPCL), a public-private partnership venture, was incorporated on 31 December 1994 as an independent power producer (IPP) to build a power plant at Mymensingh. ADB supported RPCL in building a 70 MW power plant in 	<ul style="list-style-type: none"> • Major achievement. This was a step towards breaking BPDB's monopoly on generation.

² Reforms recommended in the report "Power Sector Reforms in Bangladesh" were approved by the cabinet on 12 September 1994.

Power Sector Reforms in Bangladesh ³	Progress of Reforms Initiatives Agreed with Development Partners	Assessment by Asian Development Bank (ADB)
	<p>Phase 1. RPCL successfully implemented Phase 1 and Phase 2 of the Project, increasing capacity to 140 MW, and now sells power to the BPDB grid through a duly executed power purchase agreement.</p> <ul style="list-style-type: none"> • RPCL implemented Phase 2 of the Mymensingh power plant by mobilizing domestic resources with no support from development partners. KfW is providing partial funding to RPCL for Phase 3 construction to convert the plant to a 210 MW combined cycle project. RPCL will mobilize the remaining funds from domestic sources. • BPDB incorporated the Meghnaghat Power Company Ltd. (MPCL) on 23 November 1996 to implement the 450-MW Meghnaghat Power Station through the private sector. MPCL initiated a solicitation process that led to awarding the contract to AES Corporation, USA, to supply power to BPDB at one of the lowest rates in Asia. ADB supported MPCL for engineering of the project, and solicitation. The plant began commissioning in June 2002, and is expected to begin commercial operation in October 2002. Negotiation for Phase 2 implementation is ongoing. • The Power Cell, which initiated the process for implementation of the Haripur 360 MW power plant through the private sector in 1997 in an unsolicited manner, but later switched to a solicited process. The power plant is in operation. The World Bank supported the Power Cell, which was established in 1995 as an advisory body to the Ministry, and to assist sector entities in implementation of the reform program, to 	<ul style="list-style-type: none"> • Major achievement. This demonstrates sustainability of operations. • Major achievement. The Government has successfully implemented a private generation program. The currently IPP share of generation is about 20% but expected to increase to 40—45% by 2004. Adoption of a solicitation process helped Bangladesh attract IPPs at a highly competitive price. • Completion of the corporatization process of BPDB's existing power plants and distribution zones will create an enabling environment for private sector participation.

³ Reforms recommended in the report "Power Sector Reforms in Bangladesh" were approved by the cabinet on 12 September 1994.

Power Sector Reforms in Bangladesh ⁴	Progress of Reforms Initiatives Agreed with Development Partners	Assessment by Asian Development Bank (ADB)
	<p>process the project. The power plant was commissioned in May 2001.</p> <ul style="list-style-type: none"> • BPDB signed costly contracts with three IPP barge-mounted power plants (about 100 MW each) as an emergency step to overcome shortfalls in generation. All three plants are in operation. IPPs were selected through a solicitation process. BPDB's involvement in barge-mounted plants delayed the process of finalizing contracts for the Meghnaghat and Haripur power plants. • REB signed the IPP contract for three 10 MW plants. IPPs were selected through solicitation process. 	<ul style="list-style-type: none"> • Rationalization of the boundary between DESA and REB has already increased the market share of PBSs (considered to be private operations) from 14 to 25%. Further rationalization of the boundary between BPDB and REB as a condition of the World Bank's loan to REB will further increase the PBSs' market share.
Developing a regulatory framework to support the new structure of the sector	<ul style="list-style-type: none"> • The World Bank extended technical assistance to the Power Cell, which drafted the Electricity Reform Bill with assistance from the World Bank and ADB. The cabinet approved a draft of the bill in 2000, and again in 2002. The Government has recently decided to enact a single bill, "<i>Energy Regulatory Commission Bill</i>," to cover the electricity, gas, and oil sectors. An integrated bill has already been drafted. • Since 1997, Power Cell has helped the Ministry in regularly implementing formulas for semi-annual tariff adjustments, and has developed a rationalized tariff structure. ADB designed the adjustment formula, based on FY1994 accounts of BPDB and DESA to compensate sector entities for losses caused by increased gas prices and fluctuations in currency exchange rates. 	<ul style="list-style-type: none"> • Slow progress, but is not affecting power sector reform. Power Cell is acting as a quasi-regulator for the time being. Power Cell is assisting the ministry in formulating reform actions, tariff setting and resolution of dispute among sector entities. • Major achievement. This was a positive move towards depoliticizing the setting of tariffs, and establishing grounds for future tariff setting by the proposed regulatory body.

⁴ Reforms recommended in the report "*Power Sector Reforms in Bangladesh*" were approved by the cabinet on 12 September 1994.

Power Sector Reforms in Bangladesh⁵	Progress of Reforms Initiatives Agreed with Development Partners	Assessment by Asian Development Bank (ADB)
	<ul style="list-style-type: none"> • The Government also reduced the first slab of domestic tariff from 300 to 100 units as a step towards introducing the lifeline tariff slab. • Effective 1 August 2002, the Government raised the power tariff by 5% and, for the first time since 1992, raised the irrigation tariff. Another, increase is expected in January 2003 to fully implement the rationalized tariff structure that Power Cell developed. 	

⁵ Reforms recommended in the report *"Power Sector Reforms in Bangladesh"* were approved by the cabinet on 12 September 1994.

SCHEDULE OF ESTIMATED AND ACTUAL DISBURSEMENTS
(\$ million)

Loan 963-BAN(SF): Eighth Power Project

Fiscal Year	Quarter	Projected		Actual	
		Quarterly	Cumulative	Quarterly	Cumulative
1990	I	12.45	12.45	0	—
	II	12.46	24.91	1.24	1.24
	III	12.45	37.36	3.07	4.31
	IV	12.45	49.81	6.70	11.01
1991	I	12.45	62.26	8.29	19.30
	II	13.15	75.41	4.62	23.92
	III	12.45	87.86	5.59	29.51
	IV	12.59	100.45	9.09	38.60
1992	I	8.17	108.62	10.74	49.34
	II	8.39	117.01	4.30	53.64
	III	8.17	125.18	7.04	60.68
	IV	8.47	133.65	10.32	71.00
1993	I	7.23	140.88	10.56	81.56
	II	7.62	148.50	8.59	90.15
	III	7.23	155.73	3.74	93.89
	IV	9.29	165.02	5.44	99.33
1994	I			0.50	99.83
	II			0.69	100.52
	III			17.28	117.80
	IV			3.10	120.90
1995	I			3.71	124.61
	II			3.13	127.74
	III			4.54	132.28
	IV			0.99	133.27
1996	I			2.99	136.26
	II			1.88	138.14
	III			7.00	145.14
	IV			4.83	149.97

Fiscal Year	Quarter	Projected		Actual	
		Quarterly	Cumulative	Quarterly	Cumulative
1997	I			1.22	151.19
	II			0.94	152.13
	III			3.08	155.21
	IV			0.66	155.87
1998	I			0.88	156.75
	II			3.23	159.98
	III			1.66	161.64
	IV			1.28	162.92
1999	I			3.45	166.37
	II			3.89	170.26
	III			3.24	173.50
	IV			2.21	175.71
2000	I			3.41	179.12
	II			0.60	179.72
	III			0.09	179.81
	IV			1.01	180.82
2001	I			2.18	183.00
Total		165.02	165.02	183.00	183.00

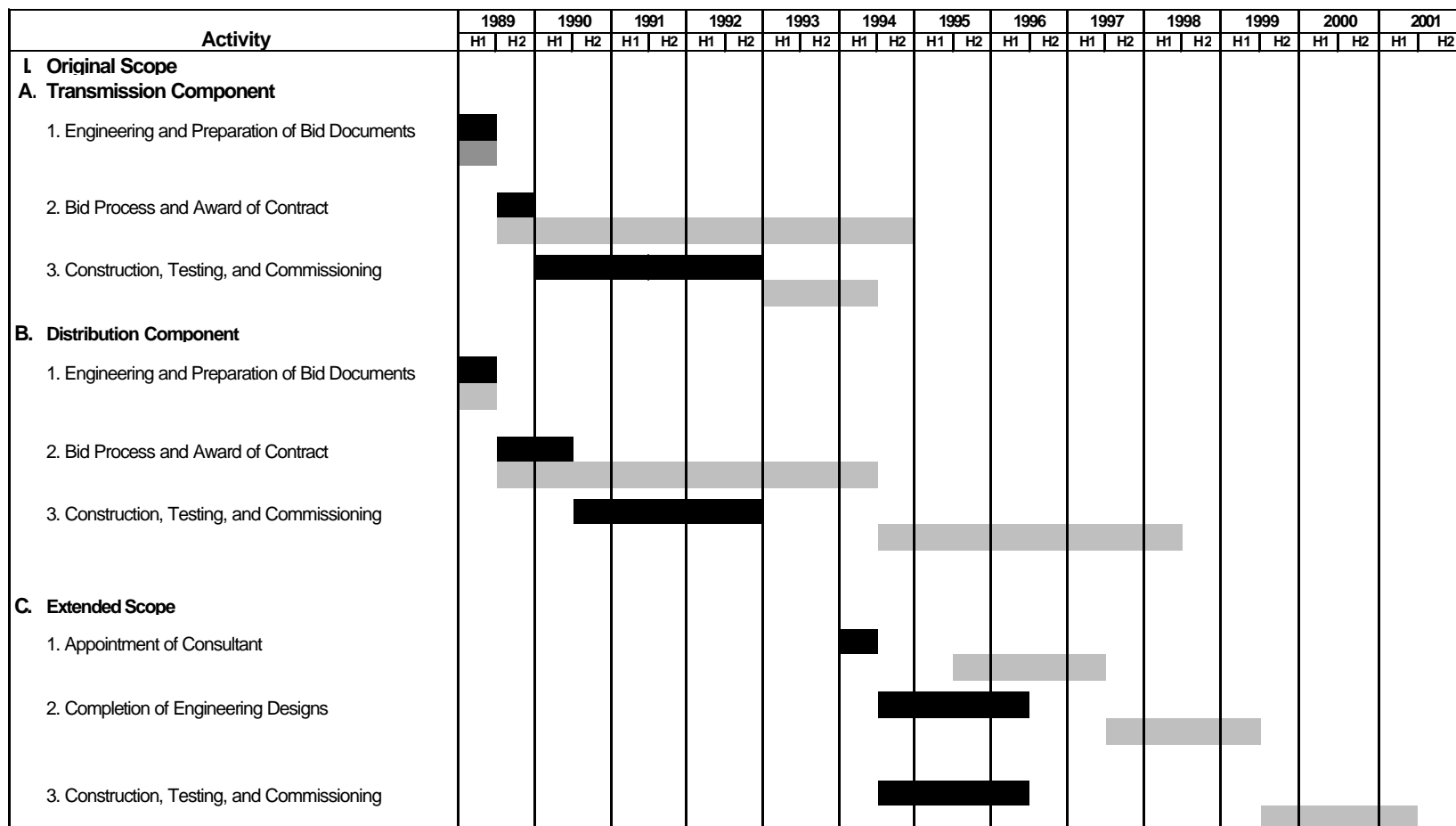
CHRONOLOGY OF MAJOR EVENTS

Date	Event
1987	
20–29 January	The Fact-Finding Mission was fielded jointly with the Overseas Development Administration (ODA).
08–17 September	The appraisal mission was fielded jointly with ODA.
1988	
9–11 March	Loan negotiations were conducted in Manila.
14 June	The Asian Development Bank (ADB) approved advance procurement action for urgently needed project components.
1989	
11 July	ADB approved a loan of SDR 132.677 million (\$165 million equivalent).
14 September	Approved for award, subject to loan effectivity, were contract nos. 57292/8A and 57292/8B for supply and delivery of 11kV overhead line conductor; and no. 57292/9 for supply and delivery of 11kV and LV cables and fittings.
28 November	The loan became effective.
1990	
02 May	The first civil works contract was awarded for construction of 132/230 kV overhead lines.
1991	
19 September	ADB received the Government's request to use savings through the loan to assist in the rehabilitation of equipment and installation of the Power Transmission and Distribution System within the Greater Chittagong Area damaged by the cyclone.
1 October	The Dhaka Electricity Supply Authority (DESA) began operations.
19 December	ADB approved a change in scope for emergency assistance for the rehabilitation of the Bangladesh Power Development Board (BPDB) installations in the Greater Chittagong Power Distribution Area that were damaged by a cyclone in April 1991.
1992	
20 February	ADB sent clarification to the Ministry of Energy and Mineral Resources on the proposed award of DESA Contract No. 57292/11: Supervisory Control and Data Acquisition (SCADA) system.

Date	Event
13 August	ADB rejected DESA's recommendation to award the contract for SCADA, and instructed DESA to revise the bidding documents and have the original bidders re-bid, following ADB's two envelope procedure.
19 December	ADB approved a change in scope to use loan savings to finance consulting services to carry out two engineering projects: (i) detailed sight investigation, a detailed design and engineering plan, and the preparation of tender documents for the first unit of a gas-fired combined cycle plant at Meghnaghat; and (ii) the design and engineering for a National Control Centre and an associated communication network.
1993	
5 November	ADB's Board approved a major change in scope and implementation arrangements, reallocation of loan proceeds, and utilization of about \$37.7 million of surplus funds and TA to Bangladesh for financial management upgrade (FMU) of BPDB and DESA. The loan closing date was also extended to 31 March 1996.
1994	
25 May	ADB approved the Executing Agency's recommendation for contract award for the SCADA.
14 September	The amended loan agreement and Project agreement were signed.
20 November	The contract for the SCADA was signed.
1996	
19 April	ADB approved the Government's request for a second extension of the loan closing date until 31 December 1997, in order to complete the works through SCADA. The works had been delayed because of delays in equipment procurement and implementation of the additional approved components because of Bangladesh's difficult political situation.
18 December	A civil works contract was awarded for the rehabilitation of the Khulna Thermal Power Plant.
1997	
3 February	The ADB review mission in the field and noted that the FMU contract was delayed because of changes in key personnel, and that continuity was lacking in this knowledge-based project.

Date	Event
30 May	The ADB review mission visited the Khulna Thermal Power Plant and noted that the boiler of this 60MW unit was in critical condition and might have to be replaced.
7 September	During the ADB review mission, the contractor of the Khulna Thermal Power Plant requested replacement, instead of partial rehabilitation, of the 60 MW boiler.
27 October	ADB approved the Government's request for the use of loan savings (about \$2.5 million) to finance rehabilitation of damage caused by a cyclone that hits Bangladesh on 19 May 1997. The loan closing date was also extended until 30 June 1999 to enable (i) rehabilitation and reconstruction of the cyclone damages, and (ii) completion of existing components through the loan.
1998	
May	A new boiler for the 60MW power plant arrived at the site from China.
1999	
25 June	The new boiler for firing the 60MW unit at the Khulna Thermal Power Plant was first fired.
30 June	ADB approved the Government's request to extend the loan closing date to 31 December 1999 to enable completion of the remaining components of the loan: viz (i) the Khulna Thermal Power Plant Rehabilitation Project, and (ii) the MU Phase II Project.
15 August	Delivery of hardware for the FMU Project, Phase II, was completed.
30 August	Installation of hardware in Dhaka and Chittagong was completed.
2000	
16 March	ADB approved the Government's request to extend the loan closing date to 30 September 2000. The loan was kept open until 31 January 2001 to allow the Executing Agency to submit remaining withdrawal applications.
2001	
23 February	The loan was closed and SDR2,333,790 was cancelled. The total loan amount after cancellation was SDR130,343,210.

IMPLEMENTATION SCHEDULE



Estimated at Appraisal



Actual

H1

First half (January - June)

H2

Second half (July-December)

COMPLIANCE WITH MAJOR LOAN COVENANTS

Covenant	Reference in Loan Agreement (LA) or Project Agreement (PA)	Status of Compliance																					
Project Management, Coordination and Operation																							
1. The Bangladesh Power Development Board (BPDB) shall be responsible for overall implementation of Part A of the Project, and the Dhaka Electricity Supply Authority (DESA) shall be responsible for Part B.	Loan Agreement (LA), Schedule (Sch.) 6, para. 1	Complied with.																					
2. The Borrower shall ensure that BPDB and DESA promptly acquire or make available all land, rights in land or rights of way, and other rights or privileges that are necessary to ensure timely Project Implementation.	LA, Sch. 6, para. 2	Complied with.																					
Environmental Protection																							
3. The Borrower shall ensure that BPDB and DESA design, construct, operate, and maintain the Project facilities in accordance with internationally accepted safety standards and relevant ADB environmental guidelines. This excludes assuring that existing rights-of-way are preserved as much as feasible, and that the Project causes minimal environmental damage.	LA, Sch. 6, para. 6	Complied with.																					
Financial and Other Matters																							
4. The Borrower shall cause BPDB and DESA to ensure that the level of total accounts receivable does not exceed the equivalent of their respective sales revenues for 3 months after 31 December 1995.	LA, Sch. 6, para. 7	Not complied with. BPDB and DESA's accounts receivable is: <table> <tr> <td></td><td>BPDB</td><td>DESA</td></tr> <tr> <td>1996:</td><td>7.6</td><td>11.1</td></tr> <tr> <td>1997:</td><td>8.1</td><td>10.9</td></tr> <tr> <td>1998:</td><td>9.4</td><td>12.6</td></tr> <tr> <td>1999:</td><td>11.7</td><td>14.2</td></tr> <tr> <td>2000:</td><td>11.8</td><td>16.5</td></tr> <tr> <td>2001:</td><td>12.0</td><td>15.7</td></tr> </table>		BPDB	DESA	1996:	7.6	11.1	1997:	8.1	10.9	1998:	9.4	12.6	1999:	11.7	14.2	2000:	11.8	16.5	2001:	12.0	15.7
	BPDB	DESA																					
1996:	7.6	11.1																					
1997:	8.1	10.9																					
1998:	9.4	12.6																					
1999:	11.7	14.2																					
2000:	11.8	16.5																					
2001:	12.0	15.7																					
5. The Borrower shall review and restructure the capital structure of BPDB and DESA from time to time to ensure that the overall ratio of long-term debt to equity of each Executing Agency does not exceed 60:40.	LA, Sch. 6, para. 8	Partly complied with. Long term debt:equity ratio for FY2001: BPDB DESA 40:60 equity is negative																					

Covenant	Reference in Loan Agreement (LA) or Project Agreement (PA)	Status of Compliance
6. BPDB and DESA shall maintain an operating ratio of less than 100% in each fiscal year.	LA, Sch. 6, para. 9 (a), 9 (b)	Not complied with. Operating ratio for FY2001: BPDB DESA 109% 126%
7. BPDB and DESA shall maintain tariffs for electricity sales at a level that will enable BPDB to finance, with funds from internal sources, not less than 20% of its 3-year average capital expenditures for FY1995, and for each fiscal year thereafter.	LA, Sch. 6, para. 9(d) ,9(e)	Not complied with. The self-financing ratio for FY2001 for BPDB and DESA were both negative.
8. Beginning in FY1990, as new meters with demand registers are installed for consumers' tariffs in categories F, G, H, and I, and for consumers with a load exceeding 30 kilowatts in categories B and C, the basing demand charges on the connected load will be discontinued. Instead, demand charges will be based on the recorded maximum demand.	LA, Sch. 6, para. 10(ii)	Complied with. The lifeline first slab is now 100 units, rather than 300.
9. Beginning in FY1990, time-of-day meters will be installed through the system loss emergency action plan for at least 1,500 consumers in the tariff categories F, H, and I.	LA, Sch. 6, para. 10(iii))	Complied with for loads exceeding 50 kW
10. Soon after Project completion, but in any event no later than 3 months thereafter or at a later date that ADB may agree to for this purpose, BPDB and DESA shall each prepare and furnish a report to ADB, in a form and in the detail that ADB reasonably requests, on the execution and initial operation of their respective part of the Project. The report should include cost, BPDB and DESA's performance of their obligations under this project agreement, and accomplishment of the loan's purposes.	PA, Sec. 2.08(c)	Complied with, late. The Project Completion Report received from BPDB and DESA during the PCR mission in September 2002
11. BPDB and DESA shall furnish to ADB audited Project accounts and financial statements 9 months after the close of each fiscal year to which they relate.	PA, Sec. 2.09(a)	Complied with, late.
12. BPDB and DESA shall furnish unedited financial statements to ADB 3 months after the end of each fiscal year.	PA, Sec. 2.09(b)	Not complied with

**TABLE A6.1: OPERATIONAL PERFORMANCE OF BPDB AND DESA
(in financial terms)**

	FY1994	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002
Generation (MkWh)									
BPDB + IPP (Gross)	9,784	10,806	11,475	11,858	12,870	14,450	15,563	17,021	18,433
IPP						578	824	2,248	3,984
Net			1						
Energy Import and Sales (MkWh)	9,221	10,166	0,845	11,243	12,182	13,634	14,739	16,309	17,672
Gross BPDB Sales	7,441	8,372	8,996	9,447	10,177	11,351	12,469	14,002	15,321
Imports by BPDB Zones	5,082	5,586	5,825	5,810	6,238	7,045	7,515	8,324	8,935
Sales by BPDB Zones	3,745	4,209	4,445	4,485	4,757	5,405	5,965	6,762	7,398
Imports by DESA	3,696	4,162	4,551	4,962	5,419	5,947	6,504	7,240	7,833
Sales by DESA	2,538	2,914	3,209	3,589	3,908	4,469	4,831	5,392	5,862
Imports by DESCO						344	550	628	673
Sales by DESCO						205	369	440	494
Imports by REB	906	1,247	1,372	1,472	1,718	2,442	3,172	4,114	4,712
Sales by REB	765	1,052	1,172	1,220	1,435	1,989	2,546	3,386	3,927
System Loss (%)									
BPDB ^a	23.95	22.53	21.60	20.33	20.93	21.45	19.88	17.73	16.41
BPDB Zones ^b	26.32	24.65	23.69	22.81	23.73	23.29	20.63	18.76	17.20
BPDB Zones (Net of Sales to REB)	30.26	29.42	28.44	27.59	29.09	29.69	26.72	24.93	23.20
DESA ^b	31.34	30.00	29.49	27.67	27.89	24.84	25.72	25.53	25.16
DESA (Net of Sales to REB and DESCO)	32.77	31.71	31.30	29.55	30.13	29.89	34.56	36.55	35.61
DESCO ^b	—	—	—	—	—	40.51	32.86	29.86	26.67
REB ^b	15.61	15.67	14.60	17.15	16.46	18.55	19.74	17.68	16.67
Overall Power System ^a	37.23	35.90	35.04	34.04	34.87	35.77	35.82	33.65	31.97

^a As a percentage of gross generation.

^b As a percentage of imports.

Source: _____.

	FY1994	FY1995	FY1996	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002
Billing and Collection (Tk Million)									
BPDB Bills	14,067	15,684	16,791	18,487	21,014	23,622	27,359	31,903	35,667
BPDB Collection	11,551	14,142	15,577	16,264	17,018	16,698	22,515	27,436	31,808
DESA Bills	5,962	6,530	7,082	8,648	9,862	10,768	11,423	13,015	14,700
DESA Collection	4,742	5,841	5,998	7,084	7,929	8,200	10,007	11,403	14,274
DESCO Bills	—	—	—	—	—	569	1,067	1,297	1,470
DESCO Collection	—	—	—	—	—	337	836	1,042	1,309
REB Bills	2,101	2,710	3,180	3,518	4,448	6,139	7,837	10,810	12,857
REB Collection	2,079	2,594	3,124	3,348	4,253	5,763	7,596	10,164	13,020
Collection, as Percentage of Billing									
BPDB	82.11	90.17	92.77	87.98	80.98	70.69	82.29	86.00	89.18
DESA	79.54	89.45	84.69	81.91	80.40	76.15	87.60	87.61	97.10
DESCO	—	—	—	—	—	59.23	78.35	80.31	89.04
REB	98.95	95.72	98.24	95.17	95.62	93.88	96.92	94.02	101.27
Collection-Generation/ Collection-Import Ratio (%)									
BPDB Collection- Generation	62.45	69.85	72.73	70.09	64.03	55.53	65.93	70.75	74.54
DESA Collection-Import	54.61	62.61	59.72	59.25	57.98	57.24	65.07	65.25	72.67
DESCO Collection-Import	—	—	—	—	—	35.23	52.60	56.33	65.30
REB Collection-Import	83.51	80.72	83.90	78.85	79.88	76.46	77.79	77.40	84.39

BPDB = Bangladesh Power Development Board; DESA = Dhaka Electricity Supply Authority; DESCO = Dhaka Electric Supply Company Limited; REB = Rural Electrification Board.

Notes:

^a To compare distribution losses of BPDB, DESA, DESCO, and REB, use the BPDB and DESA distribution losses net of inter-organizational sales.

^b Since October 1999, DESA has reflected real loss figures in some zones, which has increased DESA's system loss. The newest REB figures include losses encountered by unreported PBSSs.

^c IPP generation includes small units (3x10 MW) that sell directly to REB.

Source: _____.

FY 2001 AUDITED ACCOUNTS FOR BPDB AND DESA

TABLE A6.2: DHAKA ELECTRICITY SUPPLY AUTHORITY
INCOME STATEMENTFor the year ended 30 June 2001
(Tk)

Capital and Liabilities	Notes	For the Year 2000–2001 (Tk)	For the Year 1999–00 (Tk)
<u>Operating Revenue</u>			
Energy Sale	34	12,961,584,860	11,491,527,127
Other Operating Revenue	35	29,589,444	25,930,566
Total Operating Revenue		12,991,174,304	11,517,457,693
<u>Operating Expenses</u>			
Cost of Energy	36	13,703,084,544	11,934,993,087
Distribution Expenses	37,38	831,982,144	720,074,869
Consumer Account Expenses	39,40	194,135,782	210,659,766
General and Administrative Expenses	41,42	266,356,433	229,614,146
Depreciation Expenses	3	685,462,189	455,325,869
Provision for Bad and Doubtful Expenses		137,698,136	155,041,302
Total Operating Expenses		15,818,719,228	13,705,709,040
Operating Margin		(2,827,544,924)	(2,188,251,347)
Non-operating Income	43	194,587,914	131,151,685
Total Margin Before Financing and Other Charges		(2,632,957,011)	(2,057,099,662)
Interest Expenses		606,222,216	
Margin Before Extra Ordinary Item		(3,239,179,226)	(2,057,099,662)
<u>Extra Ordinary Items</u>			
Exchange Rate Gain or Loss		466,101,926	286,309,590
		(3,705,281,153)	(2,343,409,252)
<u>Retained Earnings Statement</u>			
Earned Surplus (Deficit)		(19,313,731,571)	(16,970,282,955)
Beginning Balance		(3,705,281,153)	(2,343,409,252)
Net Margin for Year		(23,019,012,723)	(19,313,692,207)
Adjustments for Previous Year's Income		(434,637,863)	
Adjustments for Previous Year's Expenses			39,313,731,571
Cumulative Balance Transferred to Balance Sheet		(23,453,650,587)	(19,313,731,571)

Source: Dhaka Electricity Supply Authority 2001 Audited Accounts.

SUMMARY OF ADB-FINANCED CONTRACTS

Loan 963-BAN(SF): Eighth Power Project

Contract No.	PCSS No.	Description	Currency	Contract Amount	
				(Actual)	(\$ Equiv.)
57292/2	1	132/33kV overhead lines	\$	12,463,899	12,463,899
			Tk	119,630,951	3,073,757
57292/5	2	132/33kV overhead lines	\$	14,459,589	14,459,589
			Tk	101,059,037	2,554,600
57292/8B	3	11kV and LV OH line conductor	SWF	7,269,389	5,246,697
57292/14	4	Service cable and fittings	SWF	3,502,389	2,424,093
			\$	313,654	313,654
57292/9	5	11kV and LV cables and fittings	W	9,230,239,739	12,593,069
			\$	2,013,762	2,013,762
			Y	55,283,675	463,267
57292/8A	6	11kV and LV OH line conductor	\$	9,103,697	9,103,697
57292/1	7	230kV/132kV substation equipment	W	13,242,982,571	17,050,088
			Tk	58,210,010	1,498,514
			\$	41,865	41,865
57292/15	8	11kV vacuum circuit breakers	RM	7,267,481	2,662,916
57292/17	9	Computer aided distribution equipment	\$	300,950	300,950
57292/13C	10	LV three-phase consumer metering units	SWF	5,516,448	3,919,414
	11	Earth filling works for land development for 230/132kV substation	Tk	12,187,102	324,374
57292/7B	12	11kV and LV insulator and fittings	\$	551,628	551,628
	13	Earth filling works for land development for 230/132kV and 132/33kV substation	Tk	22,203,564	580,648
	14	11kV three-phase consumer metering units	\$	1,022,461	1,022,461
57292/13A			SWF	495,795	335,180
Various	15	Various	Tk	50,564,924	1,264,194
	16	Rehabilitation of cyclone-damaged equipment	L	526,503	779,186
			Tk	8,804,744	220,296
Various	17	Various items	Tk	30,316,058	785,489
Various	18	Earthfilling of 230/132kV Substation	Tk	1,064,693	27,499
Various	19	Cyclone rehabilitation works	Tk	9,225,871	234,018
Various	20	Various civil works	Tk	1,621,233	41,424
Various	21	Various works	Tk	4,050,907	99,966
57292/6B	22	33kV cables	\$	10,736,940	10,736,940
			Tk	49,873,269	1,246,242
PUR-126/92	23	Distribution transformers and accessories	\$	283,099	283,099
57292/7C/1	24	11kV and LV poles and fittings	\$	2,300,789	2,300,789
57292/7C/2	25	11kV and LV poles and fittings	\$	2,358,872	2,358,872
57292/7C/3	26	11kV and LV poles and fittings	\$	2,409,575	2,409,575
57292/7C/4	27	11kV and LV poles and fittings	\$	2,577,187	2,577,187
Various	28	Various distribution line work	Tk	54,023,154	1,402,464
PUR-129/92/GCPDP/HT Wire	29	125 M.T. high tensile steel wire	\$	84,375	84,375
Various	30	Various	Tk	37,114,226	966,624
Various	31	Various	Tk	211,709	5,514
PUR-127/92/Cyclone/GCPDP/SEFAG	32	Hardwares and pole fittings	\$	122,190	122,190
			Tk	172,717	4,304
	33	Rehabilitation of cyclone-damaged equipment	Tk	3,223,460	82,244
Various					
Various	34	Rehabilitation work of 11kV at Chittagong	Tk	244,924	6,171
	35	Insulators/fittings—distribution line materials	\$	181,621	181,621
128/92/Cyclone/GCPDP/PEC			Tk	190,174	4,718
	36	Miscellaneous	L	7,463	11,180
Various	37	Sand, spiral wire and aircondition	Tk	1,580,347	39,300
Various	38	Various	Tk	85,358,021	2,147,211
	39	Substation equipments and materials/ cyclone damaged	\$	590,584	590,584
PUR-130/cyclone/GCDP/92			FF	1,705,510	293,438
Lot 7B Pack 2	40	Additional conductors	\$	3,757,040	3,757,040
	41	Consumer metering units	SWF	805,874	647,273

Contract No.	PCSS		Currency	Contract Amount	
	No.	Description		(Actual)	(\$ Equiv.)
Various	42	Various repairs and maintenance	Tk	1,600,633	40,166
PUR-1.374/3/94/ADB/SAMSUNG	43	Additional steel strap, buckles & tools	\$	281,526	281,526
PUR-1.374/8/Lot-7C/EASTERN	45	Service drop conductors	\$	644,518	644,518
PUR-101/94/Cyclone/ADB-963	46	Conductor and cable accessories	\$	213,202	213,202
			Tk	126,711	2,966
Various	47	Cement, wood sliper etc.	Tk	4,994,434	127,828
PUR-108/94/Cyclone/GCPDP	48	Substation materials	Y	163,963,000	1,955,072
Various	49	Repair works at feeder no. 15	Tk	40,985	985
09192	50	Radio tel. Equipment	\$	74,118	74,118
Various	51	Repair and maintenance of pole mold. etc.	Tk	588,751	14,712
57292/11	52	Supply and installation of SCADA	SKR	112,030,980	15,667,371
			FMK	13,686,002	2,575,248
			Tk	19,312,401	438,805
Various	53	Various items	Tk	41,151,922	1,030,566
PUR-1.374/88/SEFAG/Additional	54	Additional HV distribution switchgear	SWF	118,700	99,272
			\$	70,877	70,877
PO 193/3077	55	Micro computer hardwares and accessories	Tk	653,800	15,700
	56	Consultancy services for Meghnaghat	L	660,851	1,066,144
			Tk	1,808,415	33,299
Various	57	Various	Tk	1,137,367	28,188
	58	Consultancy services for NLDC	\$	964,721	964,721
			Tk	4,402,350	102,323
	59	Supervisory consultancy services for Khulna	W	858,595,368	827,870
			FF	1,612,045	274,054
			\$	76,140	76,140
			Tk	11,223,031	235,978
	60	Consumer census of Mirpur	Tk	4,055,991	96,114
	61	Consumer census of Khilgo	Tk	550,558	13,046
	63	Consumer census of Satmas	Tk	3,630,343	86,027
57292/13D	65	132kV induction type voltage	\$	151,803	151,803
	66	Consumer census and fillingup of computer	Tk		
Various				2,312,483	56,834
57292/13F	67	LV single-phase consumer metering units	\$	880,493	880,493
			Tk	12,395,975	293,097
H.V.S/S/108/94/021	68	Installation of HT metering units	Tk	726,747	17,150
	69	Rehabilitation of Khulna	\$	13,265,630	13,265,630
			Tk	39,832,538	801,607
	70	Consultancy Services - FMU II (BPDB)	\$	62,162	62,162
			NZ\$	709,250	377,470
			Tk	17,804,287	366,955
DESA/FMU/(PH-2)/Contract/97	71	Consultancy Services - FMU II (DESA)	\$	67,196	67,196
			NZ\$	758,994	408,465
			Tk	16,842,104	340,672
	72	Supply and delivery of 33kV programmable	\$	420,500	420,500
57292/13(E)					
PUR-103/98	73	Steel pole & fittings	\$	356,260	356,260
PUR-104/98	74	Distribution transformers	\$	417,155	417,155
PUR-105/98	75	Conductor and accessories	\$	1,481,002	1,481,002
PUR-107/98	76	Insulators	\$	93,640	93,640
PUR-108/98	77	Single-phase meters	\$	254,000	254,000
PUR-106/98	78	11kV dropout fuse/lighting arrestor	FF	1,463,840	234,804
			\$	208,700	208,700
09286	79	Computer systems	\$	1,753,190	1,753,190
			Tk	19,168,422	364,269
	80	Supply and installation of computer system	\$		
7407/computer system				1,172,509	1,172,509
			Tk	12,200,312	231,108

Contract No.	PCSS		Currency	Contract Amount	
	No.	Description		(Actual)	(' \$ Equiv.)
PUR-258/99/1077 09371	81	Supply and installation of computer system	Tk	4,555,485	89,120
	82	Consultancy services - FMU II (BPDB)	NZ\$	148,348	63,563
			Tk	3,847,147	71,715
DESA/FMU2/Contract-2/99-2000 PUR-108/99	83	Consultancy services - FMU II (DESA)	\$	12,214	12,214
			TK	1,908,320	35,551
	84	Purchase of Microbus	Tk	1,190,000	22,765
PS-2/PUR-2/236	85	Purchase of Toyota Lite Ace Microbus	Tk	1,111,500	21,263
PS-2/PUR-2/237	86	Purchase of Mitsubishi Lancer	Tk	950,000	18,174
TOTAL					180,177,021

The \$ equivalent values are in accordance with the exchange rates in force within the Asian Development Bank on the run date.

Tk: Bangladesh taka, SWF: Swiss Francs, Y: Japanese Yen, W: Korean Won, RM: Malaysian Ringgit, L: British Pound, PCSS: Procurement C Summary Sheet, kV: kilovolt.

ECONOMIC AND FINANCIAL INTERNAL RATES OF RETURN (EIRR AND FIRR)

ECONOMIC AND FINANCIAL ANALYSIS

A. Introduction

1. At appraisal a time slice analysis was used to estimate the EIRR and FIRR. The methodology used for the Project's reevaluation follows as closely as possible the one used for Project appraisal so results can be compared. Accordingly, a time slice approach was used to re-estimate the EIRR and FIRR. This reflects that benefits of the Project itself cannot be separated from the benefits attributable to the entire power network. The re-estimated time slice covers the period from FY1991 to FY1997, which coincides with the years of major Project disbursements. The re-estimated EIRR and FIRR costs and benefits are expressed in September 2002 prices. In line with the EIRR appraisal method, Project items valued at domestic market prices have been converted to border price equivalents by using the standard conversion factor (world price numeraire). Based on ADB's Guidelines for the Economic Analysis of Projects, where the world price numeraire is used, values for willingness to pay or willingness to accept have been adjusted by the standard conversion factor (0.855) to bring them in line with other items in the economic resource flow.

B. Costs

2. The capital costs of the time slice were extracted from audited accounts of the Bangladesh Power Development Board (BPDB) and the Dhaka Electricity Supply Authority (DESA) for FY1991–FY1997. These capital costs reflect BPDB and DESA's total capital investments from 1991 through 1997. For the EIRR, taxes, duties, and interest during construction were eliminated from the capital costs, and local costs were adjusted by the standard conversion factor. For the FIRR, taxes and duties were included, and interest during construction was excluded. Then the EIRR and FIRR capital costs were raised to 2002 prices. Similar adjustments were made to recurrent costs (fuel costs, and operation and maintenance costs).

3. In line with appraisal, annual operation and maintenance costs were estimated as a percentage of capital costs: 2% for the distribution system, 1% for the transmission system, and 1 to 3% for the generation plants, depending on energy sources. Similarly, fuel costs were estimated based on the different types of energy used. Natural gas is nontradable in Bangladesh, so its economic value was estimated based on the long-run marginal cost of extraction and bulk supply to power stations, plus a depletion premium.

C. Benefits

4. Total power generation (199–1997) was extracted from BPDB's "actual" commercial statistics. Similarly, total system losses and total sales were extracted from BPDB and DESA's commercial statistics. Incremental sales during the time slice period 1991–1997 are all sales over the 1990 sales of 4,704 GWh.

5. For the FIRR analysis, the benefits from incremental sales were valued at BPDB and DESA's September 2002 average tariff (Tk2.6 per kWh). Real tariff increases were not assumed, but the average tariff used incorporates the 5% across-the-board tariff increase that became effective in August 2002.

6. For the economic analysis during appraisal, the generated market was estimated to be 75% of incremental sales, and the remaining 25% represented the diverted market. Economic benefits then were valued on the basis of resource cost savings for the diverted market, and willingness to pay for the generated market. The assumption of 75% generated and 25% diverted was not explained during appraisal; it is difficult to justify at the Project completion stage, especially in the absence of comprehensive surveys. But based on advice from the Economics and Research Department, the reevaluation of economic benefits reflects the conservative assumption that the generated market accounts for 100% of incremental sales. Accordingly, willingness to pay (WTP) in 2002 prices was used to calculate the benefits, and no resource cost savings were assumed.

7. The lower boundary of WTP is the average tariff converted into economic terms by using the standard conversion factor (SCF) of 0.855. The upper bound is the average of the cost of kerosene lighting for domestic consumers and the cost of auto generation for non-domestic consumers (adjusted by the SCF). The WTP was calculated as the average of the lower and upper bounds. The cost of owning and maintaining kerosene lighting services and diesel generators was built into the WTP calculation. The fuel equivalence assumed was 0.7 liters of kerosene per kWh for domestic lighting, and 0.4 liters of diesel per kWh for generators.

8. The re-estimated EIRR for the time slice was 17.30% and for the FIRR, 3.25%. The reevaluated FIRR is considered to be below the weighted average cost of capital for BPDB and DESA. In the absence of dividends to shareholders (in this case, the Government) and with DESA's equity capital being negative, it is difficult to determine the exact cost of capital. But with 60% of BPDB's capital structure as equity, coupled with non-soft re-lending rates applicable to BPDB and DESA, it is reasonable to assume that the FIRR is below the threshold.

D. Khulna Thermal Power Station (60 MW Plant)

9. The EIRR for the rehabilitation of the Khulna thermal power station (60 MW plant) was estimated at 22%. Capital costs include ADB's assistance and the repairs needed during at least the next 18 months. Fuel, operation, and maintenance costs reflect information provided by BPDB. All costs and benefits are expressed in September 2002 terms. The benefits comprise incremental sales (after system loss) multiplied by the average WTP for the generated market, as defined in paragraph 7.

EIGHTH POWER PROJECT
Economic Analysis
(Take million) Constant Prices FY 2002

Year	Total Generation GWh	System Loss %	Total Sales GWh	Incremental Sales GWh	Average WTP in FY2002 prices Tk/kwh	Benefits		Generated Market WTP	Diverted Market RCS	Investment				Total	Fuel Cost	O & M Cost	Total Outflow	Net flow
						Generated	Diverted			Generation	Transmission	Distribution	Misc					
1991	8270	41	4870	165	5.22	861	0	3837		1968	3444	590	10445	9839	85	41	9965	-9103
1992	8894	41	5217	512	5.22	2673	0	7007		3593	6288	1078	19072	17966	262	127	18355	-15682
1993	9206	36	5859	1154	5.22	6024	0	4569		2343	4101	703	12438	11717	592	286	12594	-6570
1994	9784	36	6290	1585	5.22	8274	0	5997		3075	5382	923	16324	15377	813	392	16582	-8308
1995	10806	34	7122	2417	5.22	12617	0	7536		3864	6763	1159	20512	19322	1239	598	21160	-8543
1996	11474	33	7655	2950	5.22	15399	0	4816		2470	4322	741	13110	12350	1512	730	14592	807
1997	11858	32	8100	3395	5.22	17722	0	3510		1800	3150	540	9554	9000	1741	840	11581	6141
1998	11858	31	8182	3477	5.22	18150	0								1783	861	2643	15507
1999	11858	30	8301	3596	5.22	18769	0								1843	890	2733	16036
2000	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2001	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2002	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2003	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2004	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2005	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2006	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2007	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2008	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2009	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2010	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2011	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2012	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2013	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2014	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
2015	11858	29	8419	3714	5.22	19388	0								1904	919	2824	16564
																	0	0
																	EIRR	17.30%

EIGHTH POWER PROJECT
Financial Analysis
(Take million) Constant Prices FY 2002

Year	Total Generation GWh	System Loss %	Total Sales GWh	Incremental Sales GWh	Average Tariff in FY2002 prices Tk/kwh	Benefits	Investment	Fuel Cost	O&M Cost	Total Outflow	Net Flow
1991	8270	41	4870	165	2.60	429	10445	89	44	10578	-10149
1992	8894	41	5217	512	2.60	1331	19072	276	138	19486	-18154
1993	9206	36	5859	1154	2.60	3000	12438	621	311	13370	-10370
1994	9784	36	6290	1585	2.60	4121	16324	853	427	17604	-13483
1995	10806	34	7122	2417	2.60	6284	20512	1301	652	22464	-16180
1996	11474	33	7655	2950	2.60	7670	13110	1588	795	15493	-7823
1997	11858	32	8100	3395	2.60	8827	9554	1827	915	12296	-3469
1998	11858	31	8182	3477	2.60	9040		1871	937	2809	6232
1999	11858	30	8301	3596	2.60	9349		1935	969	2904	6444
2000	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2001	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2002	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2003	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2004	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2005	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2006	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2007	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2008	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2009	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2010	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2011	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2012	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2013	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2014	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
2015	11858	29	8419	3714	2.60	9657		1999	1001	3000	6657
FIRR										3.25%	

EIRR ANALYSIS OF KHULNA THERMAL POWER STATION REHABILITATION

Rehabilitate 170 MW Generation										
Year	Total Generation GWh	System Loss %	Incr. Sales GWh	Average WTP in FY2002 prices Tk/kwh	Rehab Cost	Fuel	O & M	Total Cost	Benefits	Cash Flow
1997					58			58		-58
1998					196			196		-196
1999	120	30	84	5.22	310	239	120	668	437	-231
2000	316	29	224	5.22	192	632	316	1140	1171	32
2001	316	29	224	5.22	47	632	316	995	1171	177
2002	117	29	83	5.22	40	234	117	391	433	43
2003	0	29	0	5.22	40	0	0	40	0	-40
2004	316	29	224	5.22		632	316	948	1171	223
2005	316	29	224	5.22		632	316	948	1171	223
2006	316	29	224	5.22		632	316	948	1171	223
2007	316	29	224	5.22		632	316	948	1171	223
2008	316	29	224	5.22		632	316	948	1171	223
2009	316	29	224	5.22		632	316	948	1171	223
2010	316	29	224	5.22		632	316	948	1171	223
2011	316	29	224	5.22		632	316	948	1171	223
2012	316	29	224	5.22		632	316	948	1171	223
2013	316	29	224	5.22		632	316	948	1171	223
2014	316	29	224	5.22		632	316	948	1171	223
2015	316	29	224	5.22		632	316	948	1171	223

EIRR

22%

QUANTITATIVE ASSESSMENT OF OVERALL PROJECT PERFORMANCE

1. Overall Rating

	Criterion	Assessment	Rating (0-3)	Weight (%)	WEIGHTED Rating
1	Relevance	Highly Relevant	3	20	0.60
2	Efficacy	Less Efficacious	2	25	0.50
3	Efficiency	Less Efficient	1	20	0.20
4	Sustainability	Less Likely	1	20	0.20
5	Institutional Development	Moderate	2	15	0.30
	Overall Rating			100	1.80

Note:

- Relevance:* – Project objectives and outputs were relevant to strategic objectives of the Government and the Asian Development Bank.
- 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 had other positive social impacts.

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

- >2.5 – highly successful;
- 1.6–2.5 – successful;
- 0.6–1.6 – partly successful;
- <0.6 – unsuccessful.