FINANCIAL ANALYSIS

A. Introduction

1. The financial evaluation of the proposed investments was carried out in accordance with the Asian Development Bank's (ADB) *Financial Management and Analysis of Projects.*[1] The financial evaluation covers three outputs: (i) Ashuganj Power Station Company Limited (APSCL): Ashuganj 400 megawatt (MW) combined cycle power plant (CCPP) (East); (ii) Power Grid Corporation Bangladesh (PGCB): 132 kilovolt (kV) transmission lines and substations in Chittagong Division; and (iii) Bangladesh Rural Electrification Board (BREB): Prepayment e-Metering in Dhaka Division.

B. Methodology and Major Assumptions

2. Cost streams used to determine the financial internal rate of return (FIRR) include capital costs (excluding price contingencies and financial charges), operation and maintenance (O&M) costs, and taxes and duties. The costs thus comprised land acquisition and development, civil works, equipment, incremental O&M costs, engineering consulting and project management costs as applicable to the outputs and subprojects, and contingencies. The weighted average cost of capital (WACC) was calculated and compared with the FIRR on a real basis to ascertain financial viability. The anticipated capital mix of debt to equity was used for estimating the WACC. The sensitivity of the FIRR to adverse changes in the underlying assumptions was also assessed.

3. The financial benefit of Output 1 is incremental electricity sales from the power plant, valued using the tariff methodology published by Bangladesh Energy Regulatory Commission (BERC), as applicable to gas-based power plants.[2] For Output 2, financial benefits accrue from incremental electricity wheeled through higher-capacity transmission assets. The main financial benefit for Output 3 is conversion of non-technical losses to incremental sales. Income tax was computed using the prevailing corporate income tax rates,[3] which were applied to profits.

C. Weighted Average Cost of Capital

4. WACC was calculated in real terms, considering loans from the ordinary capital resources of ADB and the loan from Islamic Development Bank (IDB) to be extended to the government, which will be on–lent to APSCL, PGCB and BREB. On–lending will be in foreign currency for a period of 20 years with a 5–year grace period for ADB component, and 15 years with a five year grace period for the IDB component. Government on–lending and lending rates have been modeled in accordance with the Government of Bangladesh regulations: 4% on-lending rate to APSCL and PGCB; 2% on-lending rate to BREB; a local currency loan interest rate of 3% for APSCL and PGCB; and a local currency loan interest rate of 2% for BREB.[4] The domestic annual inflation rate was assumed to be 6.2% for the local currency loans. The return on government equity and internal funds was estimated at 11.4%.[5] Table 1 shows the calculation of WACC for each output.

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1 ADB. 2005. *Financial Management and Analysis of Projects.* Manila.
2 Bangladesh Energy Regulatory Commission. 2008. *Bangladesh Electricity Generation Tariff Regulations.* Dhaka.
3 27.5% for PGCB; 37.5% for APSCL.
4 Ministry of Finance. Government of Bangladesh (GOB). 2011. *Lending and re-lending terms of local/ foreign currency loans.* Dhaka.
5 Cut off yield of GOB treasury bonds (15 Year) 11.40%.

Table 1: Weighted Average Cost of Capital

Item	Amount (Tk Million)	Weight (%)	Pre-tax nominal cost (%)	Post-tax real cost (%)	Weighted cost (%)
Output -1					
ADB Loan	8,947	28	4.0	1.0	0.3
IDB Loan	17,116	54	4.0	1.0	0.5
Govt. Loan	1,865	6	3.0	0.0	0.0
Equity from **GOB**	2,798	9	11.4	4.9	0.4
Equity from EA	969	3	11.4	4.9	0.1
Total Output-1	**31,696**				**1.4**
Output -2					
ADB Loan	3,501	69	4.0	1.4	0.95
Govt. Loan	280	6	3.0	0.0	0.0
Equity from GOB	420	8	11.4	4.9	0.4
Equity from EA	858	17	11.4	4.9	0.8
Total Output-2	**5,060**				**2.2**
Output -3					
ADB Loan	3,501	76	2.0	0.5	0.4
Govt. Loan	419	9	2.0	0.0	0.0
Equity from GOB	629	14	11.4	4.9	0.7
Equity from EA	40	1	11.4	4.9	0.0
Total Output-3	**4,589**				**1.1**
Overall					
ADB Loan	15,949	39	3.6	1.1	0.4
IDB Loan	17,116	41	4.0	1.0	0.4
Govt. Loan	2,565	6	2.8	0.0	0.0
Equity from GOB	3,847	9	11.4	4.9	0.5
Equity from EAs	1,867	5	11.4	4.9	0.2
Total	**41,345**				**1.5**

ADB = Asian Development Bank, EA = executing agency, GOB = Government of Bangladesh, IDB = Islamic Development Bank, Tk = taka.

D. Financial Internal Rate of Return (FIRR)

1. Output 1: Ashuganj 400 MW Combined Cycle Power Plant (East)

5. The project involves the construction of a 400 MW gas fired combined cycle power plant[6] which would be able to operate at a 85% annual capacity factor, to generate 2,822 gigawatt-hour (GWh) per year (net of 3.5% station use).

6. The Electricity Generation Tariff Regulation of BERC, 2007 provides for a two part tariff, comprising a fuel charge and a service rate charge. The fuel charge [expressed in Taka(Tk)/kilowatt-hour (kWh)] allows pass through to customers, the actual cost of generation of electricity, related to the price of fuel. The service rate tariff is the annual revenue requirement of the generation licensee divided by the net generation by the plant. Annual revenue requirement is determined as the sum of the return on the rate base and the total costs (O&M, depreciation and applicable taxes). The rate of return on the assets (rate base) is determined as the sum of

[6] Site rating 393 megawatt.

risk-free rate of return (considered in this evaluation to be 11.97%)[7] and a return to compensate investors for market risk (considered in this evaluation as 6.01%).[8]

7. Cash flows for Output 1, which are summarized in Table 2, were estimated assuming a fuel cost of Tk0.50 per kilowatt-hour (kWh).[9] The FIRR is 3.8%.

Table 2: FIRR for Output 1
(BDT in million)

FY Ending	Benefits Incremental Sales	Costs Capital	Costs O&M	Costs Taxes	Net Cash Flow
2016	0	(39)	0	0	(39)
2017	0	(3,504)	0	0	(3,504)
2018	0	(13,755)	0	0	(13,755)
2019	0	(8,215)	0	0	(8,215)
2020	0	(2,199)	0	0	(2,199)
2021	2,844	0	(891)	(304)	1,648
2022	2,931	0	(888)	(338)	1,705
2023	3,028	0	(885)	(375)	1,767
2024	3,133	0	(883)	(416)	1,835
2025	3,250	0	(880)	(461)	1,909
2026	3,379	0	(877)	(510)	1,992
2027	3,521	0	(874)	(565)	2,083
2028	3,680	0	(871)	(625)	2,183
2029	3,855	0	(868)	(692)	2,295
2030	4,051	0	(865)	(767)	2,419
2031	4,270	0	(863)	(850)	2,557
2032	4,514	0	(860)	(942)	2,712
2033	4,788	0	(857)	(1,046)	2,885
2034	5,095	0	(854)	(1,162)	3,078
2035	5,439	0	(851)	(1,293)	3,296
2036	2,729	0	(848)	(277)	1,603
2037	2,838	0	(845)	(319)	1,673
2038	2,959	0	(843)	(366)	1,751
2039	3,096	0	(840)	(418)	1,838
2040	3,250	0	(837)	(477)	1,936
NPV at WACC of			1.4%		8,324
(FIRR)					3.8%

( ) = negative, FIRR = financial internal rate of return, FY = fiscal year, NPV = net present value, O&M = operation and maintenance, WACC= weighted average cost of capital.
Note: The fiscal year ends on 30 June.

2. Output 2: 132 kV transmission lines and substations at Chittagong Division

8. A load factor of 70% and transmission losses of 2.7% were considered to estimate the incremental energy flow to be 1,536 GWh per year. The wheeling rate is based on PGCB's submission of annual revenue requirement to BERC for 132 kV lines, adjusted to reflect BERC's August 2015 tariff determination and an expectation of further real tariff increases prior to the

[7] Treasury bond yield over 20 years. (https://www.bb.org.bd/monetaryactivity/treasury.php)
[8] Historic premium determined as the difference between the return earned on the stock market (10 years) (15.8%), and treasury bond yield for the same period (9.79%).
[9] Specific fuel consumption of 6.23 scf/kWh and natural gas price of 2.82 Tk/scm.

subproject's commissioning in 2019: Tk 0.308 per kWh.[10] Cash flows for Output 2, which are summarized in Table 3, were estimated assuming an annual O&M cost of 2.5% of the investment. The FIRR of Output 2 was evaluated to be 2.2%.

Table 3: FIRR for Output 2
(BDT in million)

FY Ending	Benefits	Costs			Net Cash Flow
	Wheeling charges	Capital	O&M	Taxes	
2016	0	(576)	0	0	(576)
2017	0	(3,140)	0	0	(3,140)
2018	0	(998)	0	0	(998)
2019	305	0	(124)	(6)	175
2020	334	0	(124)	(14)	196
2021	365	0	(124)	(23)	219
2022	399	0	(123)	(32)	244
2023	436	0	(123)	(42)	271
2024	465	0	(123)	(50)	292
2025	473	0	(122)	(53)	298
2026	473	0	(122)	(53)	299
2027	473	0	(121)	(53)	299
2028	473	0	(121)	(53)	299
2029	473	0	(121)	(53)	299
2030	473	0	(120)	(53)	300
2031	473	0	(120)	(53)	300
2032	473	0	(119)	(53)	300
2033	473	0	(119)	(54)	301
2034	473	0	(119)	(54)	301
2035	473	0	(118)	(54)	301
2036	473	0	(118)	(54)	301
2037	473	0	(117)	(54)	302
2038	473	0	(117)	(54)	302
2039	473	0	(117)	(54)	302
2040	473	0	(116)	(54)	303
(NPV) at WACC of			2.2%		4
(FIRR)					2.2%

( ) = negative, FIRR = financial internal rate of return, FY = fiscal year, NPV= net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.
Note: The fiscal year ends on 30 June.

3. Output 3: Prepayment e-Metering in Dhaka Division

9. The replacement of existing meters will reduce the system loss from the existing level of 15.19% by 1.5% corresponding to the reduction of non-technical losses by 55 GWh per year. The benefits were calculated based on the average billing rate of Tk6.55/kWh of the 10 PBS and an estimated reduction in O&M costs of 3% (which corresponds to a 30% saving in overall

[10] Transmission wheeling charges were set by BERC in August 2015 at 0.28 Tk/kWh. PGCB had petitioned for a tariff of 0.38 TK/kWh. BERC's rationale for setting a tariff significantly lower that PGCB's petition was not stated. However, because the new tariff regulation which will be enforced in 2015 provides for annual reviews of PGCB's revenue requirements (following a standard regulatory approach) and in the context of a tariff that is apparently well below a cost recovery level, modest increases in the real tariff have been assumed for the purposes of this analysis (a total of 10% increase by 2019).

meter reading and billing costs).[11] Cash flows for Output 3 are summarized in Table 4. The FIRR is 2.2%.

Table 4: FIRR for Output 3
(BDT in million)

FY	Benefits	Costs			
Ending	Incremental Sales	Capital	O&M	Taxes	Net Cash Flow
2016	0	(1,779)	0	0	(1,779)
2017	0	(1,771)	0	0	(1,771)
2018	0	(884)	0	0	(884)
2019	359	0	(14)	(82)	262
2020	359	0	(14)	(82)	263
2021	359	0	(14)	(83)	263
2022	359	0	(13)	(83)	263
2023	359	0	(13)	(83)	263
2024	359	0	(13)	(83)	263
2025	359	0	(12)	(83)	264
2026	359	0	(12)	(83)	264
2027	359	0	(12)	(83)	264
2028	359	0	(12)	(83)	264
2029	359	0	(11)	(84)	264
2030	359	0	(11)	(84)	265
2031	359	0	(11)	(84)	265
2032	359	0	(10)	(84)	265
2033	359	0	(10)	(84)	265
2034	359	0	(10)	(84)	265
2035	359	0	(9)	(84)	266
2036	359	0	(9)	(84)	266
2037	359	0	(9)	(84)	266
2038	359	0	(8)	(85)	266
2039	359	0	(8)	(85)	266
2040	359	0	(8)	(85)	267
NPV at WACC of			1.1%		633
(FIRR)					2.2%

( ) = negative, FIRR = financial internal rate of return, FY = fiscal year, NPV = net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.
Note: The fiscal year ends on 30 June.

4. Overall Evaluation of Tranche 3

10. Cash flows for Tranche 3 are summarized in Table 5. The FIRR is 3.4%.

Table 5: FIRR for Tranche 3
(BDT in million)

	Benefits	Costs			
FY Ending	Incremental Sales	Capital	O&M	Taxes	Net Cash Flow
2016	0	(2,394)	0	0	(2,394)
2017	0	(8,416)	0	0	(8,416)
2018	0	(15,637)	0	0	(15,637)
2019	665	(8,215)	(139)	(88)	(7,778)
2020	693	(2,199)	(138)	(96)	(1,741)
2021	3,568	0	(1,028)	(409)	2,130

[11] O&M cost is based on the distribution expenses of BPDB for 2013–14—Tk0.82/kWh.

	Benefits		Costs		
FY Ending	**Incremental Sales**	**Capital**	**O&M**	**Taxes**	**Net Cash Flow**
2022	3,689	0	(1,025)	(453)	2,212
2023	3,823	0	(1,021)	(501)	2,301
2024	3,958	0	(1,018)	(549)	2,390
2025	4,082	0	(1,014)	(597)	2,471
2026	4,211	0	(1,011)	(646)	2,554
2027	4,354	0	(1,007)	(762)	2,747
2028	4,512	0	(1,004)	(762)	2,747
2029	4,688	0	(1,000)	(829)	2,859
2030	4,883	0	(996)	(904)	2,983
2031	5,102	0	(993)	(987)	3,122
2032	5,346	0	(989)	(1,080)	3,277
2033	5,620	0	(986)	(1,184)	3,450
2034	5,927	0	(982)	(1,300)	3,644
2035	6,272	0	(979)	(1,431)	3,862
2036	3,561	0	(975)	(416)	2,170
2037	3,670	0	(971)	(458)	2,241
2038	3,792	0	(968)	(505)	2,319
2039	3,928	0	(964)	(557)	2,407
2040	4,082	0	(961)	(616)	2,505
(NPV) at WACC of			1.5%		8,638
(FIRR)					3.4%

( ) = negative, FIRR = financial internal rate of return, FY = fiscal year, NPV = net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.
Note: The fiscal year ends on 30 June.

E. Sensitivity Analysis

11. Analyses were carried out to examine the sensitivity of the FIRR to changes in assumed values of the key variables. The changes considered were 10% increase in capital cost, 10% increase in production and O&M costs, and 10% decrease in benefits. Table 6 shows the effect of these changes on the FIRR. The financial performance of Output 1 and Output 3 are robust for most of the sensitivities tested. Output 2 is sensitive to all the parameters, reflecting the fact that the assumed transmission wheeling tariff is just sufficient to recover costs. The transmission tariff regulations which will be enforced in 2015 allow for tariff revisions to reflect actual efficient costs, providing comfort that Output 2 would remain viable even if cost and revenue assumptions prove to be optimistic.

Table 6: Sensitivity Analysis

Sensitivity Parameter	Variation (%)	Output 1 (%)	Output 2 (%)	Output 3 (%)
Base case		3.8	2.2	2.2
1. Project capital costs	+10	2.9	1.4	1.4
2. Operating costs	+10	3.6	1.9	2.2
3. Reduction in benefits	-10	2.8	1.2	1.5

12. The FIRR is expected to comfortably exceed the WACC for all outputs. Sensitivity and risk analysis indicates that the FIRR are robust under most conditions. As such, each output of Tranche 3, and all outputs of Tranche 3 as a whole, are concluded to be financially viable.

G. Financial Sustainability

13. Analysis of historical financial statements and projected financial statements was conducted for PGCB, APSCL and BREB, and key ratios have been computed.[12] The results indicate that APSCL is financially sound, with good profitability indicators, although they remain dependent on BPDB, which is has a history of losses. Accordingly, although probability of default is low, liquidity management becomes more critical for APSCL, due to untimely credit collections. BREBs financial health, although profitable is constrained by the financial performance of the PBSs. The World Bank has applied some unsatisfactory ratings in its 2014 Performance Assessment Report, highlighting sustainability concerns. However, a reform action plan supported by the WB is also in place. Furthermore, the pre-paid meters under this Project, will help to enhance the collection efficiency of the 10 PBSs greatly, and contribute to more sustainable operations. At PGCB, performance indicators have been weak in recent years - operating losses have been incurred, and debt service cover and current ratios were below desirable levels in 2014. The 2015 tariff revisions will contribute to improving PGCB's financial performance to some extent, although the tariff is still below PGCB's cost recovery level and further upward revision of tariff will be required In addition, specific financial covenants to address financial sustainability of PGCB, including the approval and implementation of a financial restructuring plan, have been incorporated in the recently approved loan to PGCB "SASEC Second Bangladesh-India electrical Grid Interconnection Project."

[12] Detailed historical and projected financial data is given in the supplementary linked document - Financial Management Assessment.