



Performance Evaluation Report

Project Number: PPE: BAN 2009-41
Investment 7165, Loan 1793, GU 1793, and CF 39
December 2009

Bangladesh: Meghnaghat Power Project

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Independent Evaluation Department
Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – taka (Tk)

	At Appraisal (October 2000)	At Extended Annual Review (March 2008)	At Independent Evaluation (August 2009)
Tk1.00 =	\$0.0186	\$0.0146	\$0.0145
\$1.00 =	Tk53.75	Tk68.56	Tk69.05

ABBREVIATIONS

ADB	– Asian Development Bank
AML	– AES Meghnaghat Limited
BOO	– build-own-operate
BPDB	– Bangladesh Power Development Board
CCGT	– combined-cycle gas turbine
CFS	– complementary financing scheme
DESCO	– Dhaka Electric Supply Company Limited
DOE	– Department of Environment
EIRR	– economic internal rate of return
FIRR	– financial internal rate of return
EPC	– engineering, procurement, and construction
GSA	– gas supply agreement
IA	– implementation agreement
IEM	– independent evaluation mission
IPP	– independent power producer
LLA	– land lease agreement
MPEMR	– Ministry of Power, Energy, and Mineral Resources
MPL	– Meghnaghat Power Limited
NPV	– net present value
O&M	– operation and maintenance
PPA	– power purchase agreement
PPER	– project performance evaluation report
PPP	– public-private partnership
PRG	– political risk guarantee
RRP	– report and recommendation of the President
PSMP	– power system master plan
TA	– technical assistance
WACC	– weighted average cost of capital
XARR	– extended annual review report

WEIGHTS AND MEASURES

km (kilometer)	– 1,000 meters
kV (kilovolt)	– 1,000 volts
kW (kilowatt)	– 1,000 watts
kWh (kilowatt-hour)	– 1,000 watt-hours
MW (megawatt)	– 1,000 kilowatts
MVA (megavolt-ampere)	– 1,000,000 volt-amperes
V (volt)	– unit of voltage
VA (volt-ampere)	– unit of reactive power

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., FY2000 ends on 30 June 2000.
- (ii) In this report, "\$" refers to US dollars.
- (iii) For an explanation of the rating descriptions used in the evaluation report, see ADB. 2007. *Guidelines for Preparing Performance Evaluation Reports for Nonsovereign Operations* Manila.

Key Words

additionality, asian development bank, bankability, build-operate-transfer concession, business success, country strategy development impact, foreign direct investment, infrastructure, bangladesh, performance evaluation, private sector development, private sector operations department, public-private partnerships, sector reform, value for money, power sector, work quality

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BASIC DATA
Investment 7165, Loan 1793, Guarantee 1793, Complementary Financing 39 to
Meghnaghat Power Limited - Bangladesh

Project Preparatory/Institution Building

TA No.	Technical Assistance Name	Type	Person-Months	Amount (\$)	Approval Date
2338	Solicitation for the Private Sector Implementation of the Meghnaghat Power	ADTA	7.0	211,000	30 May 1995
2338	Solicitation for the Private Sector Implementation of the Meghnaghat Power (Supplementary)	ADTA	6.0	222,000	12 Mar 1997
2338	Solicitation for the Private Sector Implementation of the Meghnaghat Power (Supplementary)	ADTA	8.5	165,000	3 Aug 1998

Key Project Data (\$ million)	Per ADB Loan Documents	Actual
Total Project Cost	300.0	289.6
Total Equity	80.0	75.0
Total Debt	220.0	220.0
ADB Financial Assistance		
- Direct Loan	50.0	50.0
- Complementary Financing Scheme	20.0	20.0
- Political Risk Guarantee	70.0	70.0

Key Dates	Expected	Actual
Concept Clearance Approval	2 May 1997	2 May 1997
Board Approval	December 2000	December 2000
Commercial Operations Date	31 January 2003	26 November 2002
Loan and Guarantee Agreement and Effectiveness	11 April 2001	11 April 2001
First Disbursement	October 2001	25 October 2001
Final Disbursement		13 February 2003
Project Completion Date	31 January 2003	25 November 2002
Initial Repayment Date		15 September 2003
Final Repayment	15 September 2016	

Rates of Return (%)	Appraisal	XARR ^a	PPER
Financial internal rate of return	11.4	12.0	8.6
Weighted average cost of capital	9.6	10.4	7.3
Economic internal rate of return	26.9	38.3	14.2

Client AES Meghnaghat Limited, a private limited company incorporated in Bangladesh.
Sponsor AES Corporation, an independent power producer (IPP) based in the United States.

Mission Data	No. of Missions	No. of Staff-Days
Type of Mission		
Due Diligence	6	12
Loan Negotiation	3	19
Project Administration	1	1
Annual Review Mission	1	4
Extended Annual Review	1	6
Independent Evaluation Mission	1	18

ADB = Asian Development Bank, ADTA = advisory technical assistance, PPER = project performance evaluation report, TA = technical assistance, XARR = extended annual review report.

^a Results presented in nominal terms in the XARR have been adjusted to constant (real) terms for purposes of comparison with Appraisal and PPER results.

BANGLADESH: MEGHNAGHAT POWER PROJECT

The Meghnaghat Power Project has demonstrated how to plan, prepare, and implement a successful power plant privately owned and operated by an independent power producer (IPP) in Bangladesh. The project is rated *successful*—commercially viable, financially profitable, environmentally sound, and well-managed. It has provided a significant and much-needed addition to the country's generation capacity that has helped serve the growing demand of existing and new subscribers. The Asian Development Bank's (ADB) participation and support were extensive, well-formulated, and critical to this success. Arguably, the major disappointment has been the authorities' inability to build on the project example by implementing subsequent projects using a similar approach. Because of this inability, the load shedding and supply problems that were a major reason for undertaking the project in the first place have reemerged and are now hindering Bangladesh's economic performance.

The Project

On 5 December 2000, the Board of Directors of ADB approved a direct loan of \$50 million and a complementary financing scheme loan of \$20 million for the Meghnaghat Power Project under a nonsovereign operation. Two weeks later, the Board approved a political risk guarantee (PRG) of \$70 million for the project. The Government of Bangladesh agreed to indemnify and reimburse ADB for all amounts paid by ADB under the guarantee agreement. Several financial institutions and commercial banks cofinanced the project with senior loans of \$20 million and subordinated loans of \$60 million.

The project aimed to help (i) address Bangladesh's power shortages, and (ii) improve the country's extremely low rate of access to electricity. Prior to the project, the country's annual per capita electricity consumption of 70 kilowatt-hours was one of the lowest in the world. Further, while the demand for electricity had been growing at 8% annually, the low plant utilization, inadequate investment, and high distribution losses were causing significant load shedding that peaked in 1999 at 774 megawatts (MW) and with a total duration of 1,690 hours in 335 days.

The project was developed under a build-own-operate (BOO) arrangement with the government. Meghnaghat Power Limited (MPL) was an IPP that developed and operates the 450 MW combined-cycle gas-fired power plant consisting of two gas turbine generators, two heat recovery steam generators, and one steam turbine generator. It stands on a 25.09-hectare site, 22 kilometers south of Dhaka on the northern bank of the Meghna River that supplies cooling water to the plant. The BOO concession was awarded to the AES Corporation of the United States following a competitive bidding process developed with ADB advisory support and assistance. The project company signed an implementation agreement (IA) with the government for the BOO arrangement, and a power purchase agreement (PPA) and a land lease agreement (LLA) with the Bangladesh Power Development Board (BPDB). Under the PPA, all generated electricity is to be delivered to the BPDB grid for 22 years on a take-or-pay basis. The terms and conditions include the government guarantee of the payment obligations of BPDB under the PPA; and the performance of the fuel supplier, the Titas Gas Transmission and Distribution Company Limited, under the gas supply agreement; and the lessor under the LLA. The project was completed ahead of schedule in November 2002 at a cost of \$289.6 million. The project financing scheme included \$220 million debt finance and \$75 million equity.

MPL was established as an IPP under a fixed-price, date-certain, turnkey engineering, procurement, and construction (EPC) contract. The EPC contract was awarded to Hyundai Heavy Industries Company Limited of the Republic of Korea through international competitive bidding. After the project's construction, MPL had a gas turbine maintenance contract with Ansaldo from Italy. In 2006, MPL entered into a long-term parts management agreement with Siemens Germany. Construction took 22 months and was completed on 26 November 2002, 2 months ahead of schedule. Among ADB projects, MPL was the only one that did not experience delays. Public sector loan projects were delayed on average 3.5 years. The MPL plant has been described as "the least-cost IPP in Asia." However, the low tariff was possible because the government provided a substantial subsidy on gas price for power generation. The PPA for the plant allows for a 36.5-day annual outage for operation and maintenance (O&M) in normal years and 57.33 days in every third contract year. MPL management is comfortable with such restrictions and does not expect to have any problems meeting them.

The project was constructed at a cost of \$289.6 million, about \$10 million below the initial cost estimates at loan document. MPL passed the performance tests and received a takeover certificate, which was issued to the EPC contractor on 28 January 2003. The project's commercial availability through January to October 2007 was high at 99.5%. The 2007 load factor through October was in line with budget expectations at 88.21%, while the heat rate was better than the budget target, which is expected to result in below-budget fuel costs. From the start of commercial operations until the end of September 2007, MPL had supplied about 14,875 gigawatt-hours of electricity to BPDB.

The plant is controlled through a modern software package and computerized controls. All control functions that affect the availability of the generating units are duplicated and available at several control levels to ensure adequate backup of all control functions. Further, all significant operating parameters of the generating units are monitored, including vibration and temperatures. The project is being implemented with satisfactory to good quality, addressing the needs of the Bangladesh power sector. MPL generally has met the physical objectives identified at appraisal, broadly within the budget. The O&M of the project is exemplary. Overall, the project has helped to broaden access to a competitively priced and highly reliable power supply source for Bangladesh.

Evaluation

Following ADB's *Guidelines for Preparing Performance Evaluation Reports on Nonsovereign Operations*, the project is evaluated under four headings: (i) development impacts and outcomes, (ii) ADB investment profitability, (iii) ADB work quality, and (iv) ADB additionality. An overall evaluation of project success is then presented.

The overall rating for development impact and outcome is *satisfactory* under the following Development subheadings: (i) private sector development; (ii) business success; (iii) economic sustainability; and (iv) environment, social, health, and safety performance. The project has been innovative and successful. Further, although profitability projections and economic impacts have been lower than earlier assessments, they remain *satisfactory*. The key shortcomings of the project are (i) the use of highly subsidized gas to produce electricity at low tariff for the people who reside in relatively better living conditions and have access to the grid, and (ii) the government's inability so far to replicate the success of the Meghnaghat Project. Both shortcomings are largely outside the control of both ADB and MPL.

Private sector development is rated *satisfactory*. The project is in line with ADB's development objectives by promoting investment by the private sector in Bangladesh. The government's program to induce private investment in the power sector was part of the global trend in project development and financing. The project's primary role was to contribute the badly needed baseload generation capacity to the national power supply system. The project accomplished this goal. The project was brought into operation about 2 months ahead of schedule in November 2002 and it has maintained the high levels of availability and efficiency that are needed to fulfill its purpose as a baseload supplier. As of mid-2009, the generation capacity of 450 MW of the project is 9% of that of the country. The project supports economic growth by contributing to the country's gross domestic product, which relies heavily on the availability of energy. Households benefit from switching to electricity. Productivity gains in industries have increased, which have also contributed to household welfare, while skills development and improved education have contributed indirectly to a higher quality of life. The competitive and transparent selection of a private developer who was able to implement what has turned out to be a model IPP has given the project a high local and indeed international profile. At the time when the concession was awarded, several other countries were being forced by the Asian financial crisis of the late 1990s to renegotiate flawed concessions and high-cost PPAs. Although the project company has been sold twice since inception, all full-time management and staff positions are filled with local experts with few changes since its establishment. They have maintained standards that meet high international benchmarks for operation of power stations and thereby provide the government with an excellent local comparator. The government among others is well aware that the Meghnaghat Project sets high standards, but successive administrations have not absorbed all the lessons of Meghnaghat's development and have therefore failed in their efforts to launch major new IPPs. The government's inability to so far replicate the project can be ascribed to changes in the bidding practices and business climate that have resulted in lack of interest and support from the international community. Unless or until this learning process is recognized, there is little prospect that Meghnaghat will be replicated.

The project profitability, or business success, is rated *satisfactory*. Its recalculated financial internal rate of return (FIRR) of 8.6% exceeds the weighted average cost of capital (WACC) of 7.5%. The satisfactory profitability rating is from the perspective of the project owners (ADB's client), but in many respects the result is an excellent outcome, as it strikes a fair balance between the national interest to obtain competitively priced electricity generation services, and the interests of the business owners, whose returns exceed their WACC requirement, but are not excessive. Actual and projected financial statements show that MPL is profitable, viable, and can readily meet its debt service obligations. On present trends it should continue to do so. While MPL's performance is strong, the ability of BPDB to "take or pay" for purchases of electricity is a material risk. There is a prolonged concern about the default risk of BPDB, which experiences chronic operating loss. Even though the delay in BPDB's monthly payments to MPL by about 3 months has been removed, there is still the possibility that the payment risk may increase if BPDB makes major commitments to more new IPPs without higher tariff, and better billing and collection for the entire power system. ADB is exposed to the BPDB payment risk both as a lender and as the guarantor for 15 years of the original term loan of \$70 million syndicated by a group of foreign commercial banks under the PRG. ADB's protection for the risks assumed under the PRG is a counterindemnity from Bangladesh. The primary security for the ADB loans is a first charge on MPL's assets, including all revenues and bank accounts. The BPDB payment risks are further mitigated by the government's guarantee of the PPA and, at a fundamental level, by the need for MPL's output to help manage the country's growing shortage of electricity. The recalculated FIRR of 8.6% is less than the 11.4% estimate at appraisal and less than the 12% presented in the extended annual review report

(XARR). The reduction in the FIRR from the estimates at appraisals for the report and recommendation of the President (RRP) and XARR is the result of (i) the addition of provisions for the periodic costs of overhauling a generating plant at 4-year intervals, (ii) an increase to \$252 million in the project performance evaluation report (PPER) from \$241 million (XARR) of the project base cost, and (iii) the addition of tax payments from year 15 (XARR).

The economic sustainability is rated *satisfactory*. The recalculated economic internal rate of return (EIRR) is 14.2%, which is higher than the accepted threshold of 12%. The new EIRR, however, is significantly lower than the appraisal estimate of 27% in 2000 and the XARR estimate of 38% in 2008. PPER recalculation includes the cost of overhauling the power station equipment at 4-year intervals. This expense was not included in earlier estimates of the EIRRs. PPER recalculation also accounts for the increased economic cost of using gas to generate electricity, which was not taken into account in earlier estimates. The economic benefits from the project include reduction in the use of inefficient captive power plants and high-cost diesel generators, along with the replacement of kerosene lamps by vastly superior electric lights in newly connected households. Existing consumers also benefit from the project's addition to the supply of efficiently generated low-cost electricity. In October 2000 when the RRP was prepared, the expected price for purchase of gas by Meghnaghat power plant was \$2.3 per million British thermal unit (mmbtu), which is close to the then prevailing economic value of energy. The RRP did not foresee the steep increase in the value of energy in the international markets over the next 8 years, or the rapid development of captive power generation facilities in the country. The XARR recalculations in 2008 observed that increases in the prices of petroleum products had amplified the project benefits, but the XARR underestimated the adverse effects on the cost side of rising economic value of fuel gas and omitted the costs of periodic overhauls of the power plant equipment at 4-year intervals. The sustainability of the project's economic benefits is critically dependent on (i) the security of a natural gas supply, and (ii) reduction in the level of electrical losses in the national transmission and distribution system.

Environment, social, health, and safety performance is rated *excellent*. The Meghnaghat Power Plant was established on uninhabited land that had been reclaimed for power station use by dredging fill (an acceptable practice) from the adjacent Meghna River. The power station complies with the requirements of the environmental impact assessment and the guidelines of ADB, the World Bank, and the government that were in effect at the time the project agreements were signed in 1999. Environmental monitoring is conducted for nitrogen oxide emissions, ambient air quality, noise, discharge water quality and temperature, thermal plume in relation to model predictions, and effluent quality. Sargent and Lundy, the lenders' independent technical advisor, regularly reviews MPL's environmental performance, including the annual monitoring report created for ADB and confirms that the facility meets environmental standards. The Independent Evaluation Mission (IEM) visited the power plant in May 2009 and found that MPL pays careful attention to its social, health, and safety performance. It has formalized safety procedures and practices and has had no lost time accidents for several years. The IEM also visited a nearby site where MPL is contributing \$1 million for the construction of a 30-bed hospital to serve the local community. The community hospital has taken longer than expected to implement because it took several years to identify and acquire a suitable site; however, it is expected to be operational by the end of 2009. The project has also indirectly contributed to the welfare of women and girls, e.g. through less domestic pollution and facilitation of household level education and economic activities through the use of the electricity.

ADB's investment profitability is rated *satisfactory*. It is noteworthy that ADB expects a reasonable financial return but does not have an explicitly defined quantitative measure for determining the required rate of return on loan and guarantee facilities based on risk and its

derived opportunity cost. The pricing for the ADB loan reflects the risks associated with the project in comparison with recent market benchmarks. The interest rate margin charged on ADB's direct loan to the project was benchmarked against that of the Haripur Power Station Project, a similar IPP project in Bangladesh. It was sensible for ADB to be paid back before taxation on the project. Recent accounts show the creation of a significant deferred tax liability and the rationale for such a provision during an extended tax holiday is questionable.

ADB's work quality is rated *excellent* in three categories: (i) screening, appraisal, and structuring; (ii) monitoring and supervision; and (iii) role and contribution to the project. The project traces its genesis to the 1984 Power System Master Plan prepared under an ADB technical assistance grant. The early identification of the project as a least-cost development laid a firm foundation that helped ensure the project's success. Subsequent ADB support for planning and preparing the project and ADB staff assistance were continuous and comprehensive. They covered nearly all aspects from site selection to the engagement of the IPP developer and financing of the project. ADB's monitoring mechanism is working and reporting very well on commercial risk aspects including technical performance.

ADB additionality is rated *excellent*. ADB finance was a necessary condition for the timely implementation of the project by providing comfort to attract private financiers. ADB's contribution to the project design was a critical factor in the successful implementation of the project that had substantial development impact in Bangladesh. ADB's contribution to the success of the project can be highlighted by the fact that other IPP tenders without ADB's assistance were cancelled or delayed for various reasons.

Overall, ADB's assistance to the project is evaluated as *successful*.

Lessons

ADB's approach in promoting energy sector master plans and assistance to project design have underpinned the success of the Meghnaghat Power Project. To get the trust of international investors, a project should be designed and implemented in a transparent and foreseeable way. The design of a public-private partnership (PPP) project requires higher skills of project management from a perspective broader than that for traditional procurement. The failure to replicate the project shows the importance of ADB's intervention from an early stage to shape project implementation. A PPP has a wide spectrum of structures and specific features of each project can be designed in line with project objectives reflecting fiscal positions of governments. The experience of the project shows that there are opportunities for scaling up the level of ADB's advisory capacity to improve the quality of PPP designs prior to committing ADB funding. In addition, institutionalizing the experience of PPP implementation through the support of capacity development is important to maintain the PPP as a viable procurement option to the government.

It is suggested that ADB consider undertaking a value for money (VFM) assessment as a PPP operation procedure that forms part of project appraisals. The justification of PPP projects should be reviewed from a perspective of enhanced efficiency of infrastructure procurement as well as of improved access to private finance. As PPP takes on a larger share in infrastructure development, the greater the impacts of PPP projects are on the government fiscal management. One of the features of PPP procurement is its long-term contract and hence the impact of the procurement decision lasts for a long period of time. VFM assessment is a device to assess if PPP is a better option than traditional procurement from a taxpayer's perspective in terms of a whole-of-life cost of a project.

Development impacts as well as risk mitigation should be regarded as an equally important factor in private sector operations as in sovereign operations. Under Strategy 2020, ADB will promote a larger role for the private sector in financing infrastructure. With the emphasis on PPP and private sector engagement, the development impacts of ADB operations should be strengthened. During the screening process for nonsovereign operations, the development impacts should be considered as important as risk mitigation or profitability of the project. In doing so, the economic appraisal of a project should take the full economic costs of the project in the analysis.

Recommended Follow-Up Actions

BPDB's capacity to pay MPL and other power companies for the power supplied based on consumer tariff adjustments and collection rates among the distribution companies need to be monitored closely.

In instances where the implementation of IPP projects is delayed or cancelled repeatedly, it is recommended that the government exert efforts to implement comprehensive reform in the legal and institutional frameworks to promote PPP, including legislating a PPP law. In addition, the government needs to ensure transparency in the bidding process, making it free from political influence so as to regain the confidence of developers after repeated failure of tenders. The successful bidding of the project shows that collaboration with multilaterals is an effective approach.

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