

Bangladesh: 230-kV Transmission Line Comilla - Chittagong

Ex-post evaluation

OECD sector	23040 / Electricity transmission	
BMZ project ID	1995 66 399	
Project-executing agency	Bangladesh Power Development Board (BPDB) Power Grid Company of Bangladesh (PGCB)	
Consultant	Fichtner	
Year of ex-post evaluation	2003	
	Project appraisal (scheduled)	Ex-post evaluation (actual)
Start of implementation	Q 4 1995	Q 1 1996
Period of implementation	38 months	52 months
Investment costs	EUR 60.03 million	EUR 54.00 million
Counterpart contribution	EUR 16.57 million	EUR 22.48 million
Financing, of which Financial Cooperation (FC) funds	EUR 43.46 million	EUR 31.52 million
Other institutions/donors involved	none	none
Performance rating	Overall sufficient degree of developmental effectiveness (rating 3)	
• Significance/relevance	Rating 3	
• Effectiveness	Rating 3	
• Efficiency	Rating 4	

Brief Description, Overall Objective and Project Purposes with Indicators

The project “230-kV Transmission Line Comilla – Chittagong” comprised the construction of a 151 km-long 230-kV double-circuit line connecting the substations Comilla North and New Hathazari (Chittagong). This section of the line marks a continuation of the 80-km 230-kV double-circuit line Ashuganj-Comilla, also funded through German Financial Cooperation (FC) and completed in 1993, and serves to transmit electrical power compensating for fluctuations in supply and demand between the load centers Chittagong and greater Dhaka. The project is also tied to the implementation of sector reforms initiated in the mid-1990s.

The project-executing agency was initially the national power utility Bangladesh Power Development Board (BPDB). During the course of the sector reforms the Power Grid Company of Bangladesh (PGCB) was founded as an independent company specializing in the operation

and expansion of the transmission system and which has since also taken charge of the Comilla – Chittagong line financed under the project.

The project purpose was to transmit electrical energy efficiently and reliably, especially to supply greater Dhaka with power. In Dhaka the local productive power consumers from industry, trade and commerce made up the target group. The overall objective of the project was to play a role in the economically efficient supply of power in Bangladesh. The project was to make its contribution in the context of sector reforms, with the successful implementation of certain reforms being a precondition for disbursement of the FC funds.

The following three indicators were defined to measure achievement of the overall objective:

- a) The sector reform programme has been completed. The key aspects of the recommendations put forward with the consent of the donor community have been implemented by the Bangladeshi government.
- b) Measured in terms of the long run marginal costs, the economic cost recovery ratio is at least 80%.
- c) The proportion of productive power consumption exceeds 60%.

The indicator laid down to determine whether the project purpose has been achieved was that the 230-kV line must be loaded during peak times in the range of the economic load of 2 x 100 MW and transmit approx. 600 GWh annually.

Project Conception / Major Deviations from the original Project Planning and their main Causes

The project comprised the following investment measures:

- Construction of a 151-km-long 230-kV double-circuit transmission line from Comilla North to New Hathazari (Chittagong).
- Equipment of the relevant switchboards in Comilla North and New Hathazari with grid protection relays, fault recorders and PLC-equipment.
- Supply of six small trucks, two all-terrain vehicles and two passenger vehicles for the district administrations in Comilla and Chittagong for maintenance purposes.
- Supply of tools, spare parts and measuring equipment for three-year period of operation of the power line.
- Consulting services.

Only minor changes were made to the concept during project implementation. In seven cases the power poles had to be built higher or moved owing to unforeseen obstacles. The connection of the double-circuit line to the New Hathazari substation was redesigned to save space. Contrary to the original planning a lightning protection cable with an integrated glass fibre communication line for signal transmission was installed. The fleet of motor vehicles was adapted to the wishes of the BPDB with KfW's approval. After one of the two lightning protection

cables in a 25-km section along the double-circuit line from Ashuganj – Comilla North was stolen, a new lightning protection cable with an integrated glass fibre communication line was installed along the entire section from Ashuganj – Comilla North under a supplementary agreement, making it possible to transmit signals through the whole line between Ashuganj and New Hathazari.

Project implementation was delayed by 18 months in comparison to the planning. With an implementation period of 56 months instead of the scheduled 38 months the project exceeded the time frame proposed in the project appraisal by nearly 60%. The main reason for this considerable deviation from the schedule was neglect to fulfill one covenant which required the Bangladeshi government and other state agencies to satisfy outstanding accounts vis-à-vis the BPDB through payment or offsetting as of June 30, 1995 and to limit the outstanding accounts due by public agencies to three months' revenues. This covenant was later modified by KfW in agreement with the Federal Ministry for Economic Cooperation and Development (BMZ) to make it possible to implement the project. However, even the modified covenant was not fulfilled. Since project implementation was doubtful for a certain time owing to non-fulfillment of the covenant, the project-executing agency used a government loan to install a 132-kV line in addition to the planned 230-kV double-circuit line. This 132-kV power line is now redundant and has ultimately turned out to be a failed investment.

Key Results of the Impact Analysis and Performance Rating

Most of the criteria for measuring achievement of the overall objective were satisfied. The majority of the reform recommendations put forward by the donor community during project appraisal could since be realized. Only the transformation of the power supplier DESA into a joint stock company has not yet taken place. The cost recovery ratio, estimated at a mere 55% during project appraisal, also improved significantly. During the budget year 2002/03 the weighted effective average tariff for final consumers was BDT 326/MWh. Measured against the long run marginal costs of supplying power, which amount to approx. BDT 398/MWh, a cost recovery ratio of 82% was reached. In contrast, little progress was made with regard to the use of power for productive purposes: productive consumption still accounts for roughly 60% of total consumption. Yet, it may be concluded that the project was accompanied by overall successful sector reforms that improved the efficiency of the power utilities. The overall economic efficiency of electricity supplies has increased, although it is still not entirely satisfactory because one indicator (grid losses) still does not correspond to the requirements set forth in KfW's operational appraisal criteria.

With respect to achievement of the project purposes, it can be noted that the quantities of power transmitted via the line still have not reached the 600 GWh per year expected in the project appraisal. Annually 466 GWh were transmitted on average (June 2000 – September 2003). The average amount of transmitted power fell, however, from 46 GWh/month in the year 2002 to 39 GWh/month in 2003, due mainly to a decline in power exports to Comilla and the Central Region. Although this tendency can be expected to turn around, it is extremely difficult to project when the line will be utilized as expected. At 2 x 100 MW the maximum load was below the 234 MW target projected for 1998, but it satisfied the indicator of achievement of the project purpose. Worth noting is also that the project does not serve solely to transfer excess generated power out of the Chittagong region. Instead, the line is fed from both sides and transmits energy to and from Chittagong, depending on regional imbalances in power demand and supply. Only around 55% of the 1,553 GWh transmitted thus far were power deliveries from Chittagong to

Comilla and the Central Region. A downward trend can even be noted in the power exports from Chittagong (from an average of 24 GWh/month in the year 2000 to 17 GWh/month in 2003). The surprisingly high share of power imports to Chittagong has to do with power shortages caused by still frequent failures at the Raozan thermal power plant and the seasonal bottlenecks at the Kaptai hydropower plant. Unless generation capacities in the Chittagong area are increased, it is to be expected that the needed imports will grow considerably owing to higher demands for power, above all in the port city of Chittagong.

After taking up operation on May 31, 2000 the 230-kV double line became the responsibility of the two competent local district administrations of the BPDB. Since January 1, 2003 the line is included in the assets of PGCB. When all high-voltage lines were transferred to the PGCB the district administrations were also transferred to the new grid operator. Maintenance of the northern section of the line falls under the responsibility of the district administration of Comilla, whereas the district administration Chittagong is responsible for the southern section. Both administrations have sufficient and experienced personnel. The small trucks and all-terrain vehicles supplied under the project are used by both for maintenance work. The spare parts and tools also supplied under the project are stored at the yard of New Hathazari. The line is inspected visually once a month and checked once annually ("dead line check"). The personnel of the substations Comilla North and New Hathazari are in charge of operating the line.

Despite the adequate condition of the line from Comilla – Chittagong, a few interruptions in operation could not be avoided. The failure statistics for the period January 2002 – September 2003 illustrate that the two circuits were affected by eight failures each, totalling 75 hours. This translates into a probability of failure for at least one circuit of 1.8 days per annum. Approx. 75% of the interruptions were brought about by maintenance or repair work. However, only 25% of the interruptions were planned; 75% of the downtime was caused by unforeseen problems. In two cases the failures were caused by the switchboard in New Hathazari, which was built with Chinese funds and to which the transmission line connects.

Since the PGCB does not buy and sell energy but instead only uses the grid to transmit power on behalf of third parties, the company's main source of income is transmission tariffs. Until the end of 2002 the BPDB billed the buyers for the power in the form of monthly lump-sum tariffs, and the BPDB then transferred the tariff revenues to PGCB. Then PGCB introduced a uniform transmission tariff. It amounts to BDT 176.8/MWh and is based on formulas and calculations developed in the year 1999. Previous transmission tariffs sufficed to cover necessary operating expenses, yet the acquisition of all assets and liabilities forces the PGCB to strive for higher revenues. However, even the changeover to a uniform transmission tariff is not helping to achieve this aim. According to the PGCB's calculations a tariff of BDT 283.2/MWh is necessary in order to adjust the revenue situation to the new requirements. This tariff would ensure a return on equity of 10%. The PGCB assumes that the independent regulatory authority currently being established will approve cost-covering transmission tariffs once it takes up operation. The PGCB's lack of profitability and financing capacity is reflected by its low return on equity (2002/03: 1.07%) and its insufficient self financing ratio of 3.5% in 2002/03. Its liquidity is not at risk, however. Otherwise, the separation of the PGCB from the BPDB can be seen in a positive light. Its management is highly qualified, ambitious and determined to run the grid operating company according to private-enterprise criteria and to generate commercial success. The other employees are also considered to be well-trained, experienced and motivated.

The total amount of avoided transmission losses and avoided load shedding averages 84 GWh p.a. The usual standard of measuring the economic value of these 84 GWh is the consumers'

willingness to pay which, in turn, at least matches the average power tariff in real terms, currently EUR 46.57/MWh. Added to this is the consumer rent, i.e. the difference between the consumers' readiness to pay and the costs of supplies for which, however, only estimates are available that are based on a number of assumptions. For example, calculations performed for a study by USAID indicate that the willingness to pay for avoided planned power cuts is at EUR 286/MWh. If the avoided 84 GWh p.a. are valued conservatively at EUR 46.57/MWh, the project's overall economic rate of return amounts to 9.00%. If EUR 286/MWh are entered into the calculation, profitability rises to 39.46%. It should be pointed out that the 84 GWh neglect to take various additional advantages of the power line into consideration. For instance, the line enables additional power deliveries on the basis of otherwise unused generation capacity. Contrary to the grid losses, the economic fuel costs would have to be subtracted from the overall economic value of these deliveries since they would not have incurred without the additional use of available generation capacity. At any rate, it can be concluded that the project is profitable in economic terms, even if its benefits are valued conservatively.

In terms of the partial criteria for measuring project success it can be stated that, measured against the defined indicators, the project goals have not been achieved so far in full, but due to the expected higher use of the transmission line in the long run the project's effectiveness is still sufficient (rating 3). Since the line is a sensible technical and economic complement for the interconnected grid and contributes to economically efficient power supplies, the project also satisfies a key component of the overall objective. Nevertheless the sector reforms tied to the project have not been fully implemented – despite partial successes. Therefore, important developmental impacts have yet to come. For this reason the project's relevance/significance is not completely satisfactory and is assigned an overall sufficient degree of developmental effectiveness (rating 3). The economic profitability of the project is at least satisfactory. In financial terms as well the project is a cost-efficient solution. However, its financial and economic advantages are affected by problems that still have not been resolved (commercial and technical losses). Beyond that they are negatively affected by the fact that apart from the FC-funded 230-kV double line installed by the project-executing agency a parallel 132 line was built which, looking back, was a waste of scarce resources and placed a heavy financial burden on the project-executing agency. Consequently the project's developmental efficiency is slightly insufficient overall (rating 4). After considering the above mentioned key criteria, we classify the project **overall as having a sufficient degree of developmental effectiveness (rating 3).**

General Conclusions applicable to other Projects

As regards impacts for all other projects, the project at hand raises the question of how unrealistic FC covenants could be avoided, and what steps should be taken in case preconditions for disbursement are not fulfilled. Since, according to definition, preconditions for disbursement imply the risk of non-implementation of a project, they should only be agreed if they are essential for project success. This was not the case for the project at hand since it is considered successful despite the fact that one of the preconditions for disbursement was not met. However, if a decision is taken in favor of such a precondition, it must then be applied consistently.

Legend

Developmentally successful: Ratings 1 to 3	
Rating 1	Very high or high degree of developmental effectiveness
Rating 2	Satisfactory degree of developmental effectiveness
Rating 3	Overall sufficient degree of developmental effectiveness
Developmental failures: Ratings 4 to 6	
Rating 4	Overall slightly insufficient degree of developmental effectiveness
Rating 5	Clearly insufficient degree of developmental effectiveness
Rating 6	The project is a total failure

Criteria for the Evaluation of Project Success

The evaluation of a project's "developmental effectiveness" and its classification during the final evaluation into one of the various levels of success described in more detail below concentrate on the following fundamental questions:

- Are the **project objectives** reached to a sufficient degree (aspect of project effectiveness)?
- Does the project generate sufficient **significant developmental effects** (project **relevance** and **significance** measured by the achievement of the overall development-policy objective defined beforehand and its effects in political, institutional, socio-economic and socio-cultural as well as ecological terms)?
- Are the **funds/expenses** that were and are being employed/incurred to reach the objectives **appropriate** and how can the project's microeconomic and macroeconomic impact be measured (aspect of **efficiency** of the project conception)?
- To the extent that undesired (**side**) **effects** occur, are these tolerable?

We do not treat **sustainability**, a key aspect to consider for project evaluation, as a separate category of evaluation but instead as a cross-cutting element of all four fundamental questions on project success. A project is sustainable if the project-executing agency and/or the target group are able to continue to use the project facilities that have been built for a period of time that is, overall, adequate in economic terms or to carry on with the project activities on their own and generate positive results after the financial, organizational and/or technical support has come to an end.