



Validation Report

Reference Number: PCV: BHU 2008-23
Project Number: 29242
Loan Number: 1712
July 2008

Bhutan: Sustainable Rural Electrification Project

Operations Evaluation Department
Asian Development Bank

ABBREVIATIONS

ADB	–	Asian Development Bank
BPC	–	Bhutan Power Corporation
DOP	–	Department of Power
EIRR	–	economic internal rate of return
PCR	–	project completion report
SCADA	–	supervisory control and data acquisition system

WEIGHTS AND MEASURES

kV	–	kilovolt	=	1,000 volts
kVA	–	kilovolt-ampere	=	1,000 volt-amperes
kWh	–	kilowatt-hour	=	1,000 watt-hours

NOTES

- (i) The fiscal year (FY) of the Department of Power (subsequently Bhutan Power Corporation) ends on 31 December. FY before a calendar year denotes the year in which the fiscal year ends.
- (ii) In this report, "\$" refers to US dollars.

Director	Ramesh B. Adhikari, Operations Evaluation Division 2 Operations Evaluation Department
Team leader	Barbara Palacios, Evaluations Officer, Operations Evaluation Division 2 Operations Evaluation Department
Team members	Irene Garganta, Operations Evaluation Assistant, Operations Evaluation Department, Division 2 Operations Evaluation Department

PROJECT COMPLETION REPORT VALIDATION

A. Basic Project Data		PCR Review Date Posted:		
Project Number:	29242		Appraisal	Actual
Project Name:	Sustainable Rural Electrification Project	Total Project Costs (\$ million):	12.5	11.6
		Loan/Credit (\$ million):	10.0	9.2
Country:	Bhutan	Cofinancing (\$ million):	0.0	0.0
Sector:	Energy	Borrower Contribution (\$ million):	2.5	2.4
Financing (\$ million):	10.0	Board Approval Date:		25 Nov 1999
	ADF: 10.0 OCR: 0.0	Closing Date:	31 Mar 2004	12 Jan 2006
Cofinanciers:				
Project Officers:	Name: C. Pappas S. Tumiwa K. Ogino	Designation: Senior Project Specialist Renewable Energy Specialist Energy Sector Specialist	From 1999 April 2002 April 2006	To April 2002 April 2006 PCR
Evaluator:	C. Brown	Director:	R. B. Adhikari	
Quality Control Reviewer:	B. Palacios			

ADF = Asian Development Fund, OCR = ordinary capital resources, PCR = project completion report.

B. Project Description (in the report and recommendation of the President)

- (i) **Rationale and expected impacts.** Although Bhutan has substantial sources of clean and renewable hydropower energy and exports power to India, distribution of electricity throughout the country is still limited. In 1997, about 80% of the population, mainly in rural areas, did not have access to electricity. Since 1981, the Government has addressed balanced regional growth through community consultation and participation. Local communities (*gewogs*) now take part in the planning, implementation, and management of social infrastructure. To date, most rural communities have access to primary schools, hospitals, and local markets, but many of these facilities lack electricity, creating a strong demand for it in these establishments as well as in rural households. More than two thirds of Bhutan's rural community live below the estimated poverty line. The provision of electricity was expected to reduce poverty in rural areas by increasing opportunities for employment and access to improved (through electrification) government services such as education and health. A reduction in migration to the cities, population control, and reduced fuelwood consumption (among the highest in the world at 1.22 tons per capita) were also anticipated benefits.

Under the Government policy of using a participatory approach for rural infrastructure, the rural electrification program during the Eighth 5-Year Plan (1998–2002) was created based on the consensus of local communities. Close consultation with the beneficiary local communities was undertaken during the technical feasibility study and socioeconomic study under the project preparatory technical assistance. Based on other successful operations in Bhutan, photovoltaic systems (solar panels) for use in local community centers were included in the Project to maximize the development impact of rural electrification. The Project also expected to address human resource constraints and capacity building of the Department of Power (DOP) by introducing advanced technology such as a supervisory control and data acquisition system (SCADA) to utilize qualified technical staff more efficiently.

The Asian Development Bank (ADB) has taken a lead role in assisting with power sector reform in Bhutan to commercialize the power sector by establishing a transparent and accountable sector operation and an autonomous power utility. ADB has maintained close consultation with the United Nations Development Programme Global Environment Facility and other bilateral sources of aid, such as Austria.

- (ii) **Objectives or expected outcomes.** The primary objective of the Project was poverty reduction. There were six identifiable sub-objectives:

- (a) Provide opportunities for cash-generating businesses.
- (b) Create jobs.
- (c) Improve quality of rural life.
- (d) Support adequate education and health services for rural people, especially low-income groups, by improving electrification with distribution network expansion and use of solar panels.
- (e) Facilitate efficient use of limited skilled human resources of DOP by introducing a simple SCADA system.
- (f) Support institutional strengthening by corporatizing DOP.

The first four sub-objectives relate directly to poverty reduction and were to be achieved by (i) extension of electrical distribution systems, (ii) supply of solar panels to remote areas, and (iii) supply of house wiring kits free of charge to poor households.

The fifth sub-objective was to be achieved by introduction of a SCADA system in the Thimphu area of Bhutan, which would result in lower electricity costs and improved service, thereby benefiting the entire community. The sixth sub-objective (associated with an attached technical assistance grant) to transition the DOP from a government division to a corporation, aimed to provide a more effective and efficient energy sector and lower-cost electricity supply, to the benefit of all members in the community, including the poor. Both of these sub-objectives relate indirectly to poverty reduction.

- (iii) **Components.** Three major components were defined as part of the loan:

- (a) Rural electrification through 33 kilovolt (kV), 11 kV, and 0.4 kV distribution systems.
- (b) Remote rural electrification in three districts using renewable energy, particularly solar panels, for local community centers including schools and hospitals.
- (c) A small-scale pilot SCADA system for substations close to Thimphu.

In addition, the Project included an attached technical assistance grant, which provided consulting services to support the Government in unbundling DOP into (i) the Department of Energy, serving as the Government's policy and planning agency; and (ii) the Bhutan Power Corporation (BPC), as the utility service company managing transmission, distribution, and supply of electricity within the country.

A breakdown of the three major components into subcomponents is provided in Table1.

- (iv) **Outputs.** The Project was designed to accomplish four outputs:

- (a) Provision of electricity to 6,010 customers in 15 districts through extended distribution systems.
- (b) Provision of electricity to three remote rural districts using solar panels.
- (c) Effective load dispatch in the Thimphu area by the introduction of a pilot SCADA system for monitoring of five stations (four substations and one diesel station).
- (d) Corporatization of DOP.

By completion of the Project, the scope of work had increased to provide electricity to 8,090 customers connected to the distribution systems, additional electrification to community centers in remote villages with 100 solar panels, and more effective load dispatch by extension of the SCADA system to 10 stations.

C. Evaluation of Design and Implementation (evaluator assessment of actual versus envisioned)

- (i) **Relevance of design and formulation.** The plan for rural electrification was formulated as part of the Government's Eighth 5-Year Plan (1998–2002), making it consistent with Bhutan's long-term rural electrification objective of 100% electrification of the country by 2020. Expansion of rural electrification was also in line with ADB's country strategy for Bhutan, because the provision of electricity was expected to reduce poverty in rural areas by increasing opportunities for employment and access to improved social services, such as education and health. The Project was the second ADB loan for rural electrification in Bhutan. The first loan (\$7.5 million) provided rural electrification for about 3,100 households. That first project, completed in June 2000, was rated successful; and it was therefore expected that a similar rural electrification project would be highly successful. Following the first loan project, however, the overall performance of the power sector remained weak and unstable, with no rational tariff structure and no regular tariff adjustments. It was apparent that the sector was in need of support. To address the sector problems, technical assistance was attached to this project to achieve needed reforms and to establish the corporate structure that would support sustainable economic growth. From the outset, the design of the Project was highly relevant.
- (ii) **Outputs and costs by component as envisioned during appraisal as compared with actual costs and achievement of outputs; reasons for any deviation.** The Project had, in effect, four components with 10 contract items, or subcomponents. These items are shown in Table 1, with actual costs at completion compared with appraisal estimates.

Table 1: Comparison of Project Cost at Appraisal and Completion
(\$'000)

(\$ 000)

Item No.	Item		Appraisal Estimate			Actual		
Project Subcomponents			Foreign	Local	Total	Foreign	Local	Total
1.	Electrical Distribution Components	33 kV Overhead Lines including Load Break Switches and Auto-reclosers	2,224.00	2,485.00	2,709.00	2,286.60	775.94	2,489.34
2.		11 kV Overhead Lines including Load Break Switches	998.00	248.00	1,246.00	1,015.8	250.22	1,266.03
3.		Distribution Substations: 33/0.4 kV Transformers	663.00	99.00	762.00	191.82	99.84	291.66
		11/0.4 kV Transformers	390.00	60.00	450.00	112.83	60.54	173.37
4.		Low Voltage Distribution	2,193.00	522.00	2,715.00	2,570.83	526.67	3,097.50
5.		Service Connections	753.00	167.00	920.00	1,063.98	168.49	1,232.47
6.		Administrative and Overheads	0.00	300.00	300.00	0.00	783.03	783.03
7.		Consulting Services	250.00	85.00	335.00	258.90	0.00	258.90
8.		Solar Panels	100.00	0.00	100.00	61.26	0.00	61.26
9.		SCADA System	250.00	0.00	250.00	281.40	0.00	281.40
10.		Miscellaneous (Vehicles, Tools, Communication Equipment, and Computers)	730.00	100.00	830.00	1,161.96	0.00	1,161.96
		Subtotal (A)	8,551.00	2,066.00	10,617.00	9,005.39	2,378.12	11,383.51

1.	Physical Contingencies ^a	851.00	178.00	1,029.00	0.00	0.00	0.00
2.	Price Contingencies	308.00	252.00	560.00	0.00	0.00	0.00
	Subtotal (B)	1,159.00	430.00	1,589.00	0.00	0.00	0.00
Financial Costs C							
1.	Service charge on ADB Loan ^b	243.00	0.00	243.00	243.00	0.00	243.00
	Subtotal (C)	243.00	0.00	243.00	243.00	0.00	243.00
Total		9,953.00	2,496.00	12,449.00	9,248.39	2,378.12	11,626.51

kV = kilovolt; SCADA = supervisory control and data acquisition system.

Note: \$1.00 = Nu42.50.

^a 10%.

^b 2.4% per annum for foreign exchange costs; 7.4% for local currency costs.

Source: Bhutan Power Corporation.

At \$11.6 million, the actual cost of the Project was lower than the \$12.5 million estimated at appraisal—a 7% underrun, even with significant variations (mainly increases) in the scope of work. The electrical distribution system was the major component and the major cost (and provided the fewest problems in project implementation); the solar panels and SCADA system accounted for less than 3% of the total project cost. The financing plan assumed all foreign exchange costs to be financed by the ADB loan and local currency costs to be financed by the Government. Of the \$11.6 million total cost, the Borrower, the Kingdom of Bhutan, financed \$2.4 million and ADB \$9.2 million. The project completion report (PCR) reported that the contribution in kind of the Borrower and the Department of Power (Bhutan Power Corporation after 1 July 2002) was satisfactory, and all necessary resources were provided to allow the Project to proceed to a successful completion.

Although the total cost on completion was well within budget, there was a considerable difference between the design and unit costs used at appraisal and at completion. As reported in the PCR, the average monthly electricity consumption of all metered electrified households surveyed by the project preparatory technical assistance was 62 kWh. It was further concluded from the survey that (i) electricity costs represented only a small proportion of household income, (ii) there was a strong willingness to pay a higher tariff for electricity should this be necessary, and (iii) the elasticity of demand for electricity was very low. These findings indicated that an average household consumption exceeding 62 kWh would be unlikely, particularly if the Project specifically targeted poorer households. In spite of this, the economic analysis undertaken at appraisal assumed an average household electricity consumption of 120 kWh per month, increasing to 180 kWh per month after 10 years of electrification. It is unclear why the Project was formulated using almost twice the assumed average electricity consumption that was indicated by the findings of the socioeconomic survey. BPC advised the Project Completion Review Mission that the average monthly electricity consumption of domestic households in rural areas is currently only 49 kWh, validating the socioeconomic analysis. Thus, it appears that the cost estimate and the economic analysis at appraisal were seriously miscalculated; and it is only because of the unplanned increases in the number of connected consumers and the lower unit cost of supply¹ that an economic Project was achieved. The design of the Project could have been able to address these issues at the onset.

(iii) **Project cost, disbursements, borrower contribution, and conformance to schedule (as relevant to project performance).** There were no problems with project performance related to project cost and disbursements. Changes in scope of work, claims, and negotiations occurred, as normally happens during project implementation. The PCR states that, as part of the Borrower contribution, the Borrower and Executing Agency provided all necessary resources for the successful implementation of the Project.

¹ The PCR reported that the actual cost per connected customer was \$1,454 compared to \$2,080 estimated at appraisal—a 30% difference between the actual and the design cost estimate.

There were two extensions to the loan closing date. The first was because of delays in construction of substations that were mostly within the Executing Agency's control. Construction of these new substations was not part of the Project; however, the SCADA system could not be installed until they were substantially complete. This delay was overcome by the Executing Agency and contractors, and the installation of the Project's main component (extension of distribution systems) was completed ahead of the appraisal schedule. The second loan closing date extension was caused by the failure of the SCADA supplier to provide the equipment on time, resulting in a 20-month delay in implementing the monitoring and control of the designated substations. The SCADA system was a small pilot project, however; and the delay had no impact on the electrical supply to the new extended distribution systems or supply of solar panels.

The key dates showing the planned and actual performance are provided in Table 2.

Table 2: Key Dates Relating to Project Performance and Disbursements

Activity		Date	Running Mon ths
Loan Effectiveness		14 January 2000	0.0
Original Expected Closing Date in Loan Agreement		31 March 2004	51.5
Final Disbursement:	- Original Scheduled Date	31 March 2004	51.5
	- Actual Date	12 January 2006	72.0

Source: ADB. 2007. *Project Completion Report on the Sustainable Rural Electrification Project in Bhutan*. Manila.

(iv) Implementation arrangements, conditions and covenants, and related technical assistance.

At the time of loan effectiveness, the Executing Agency was the DOP, a government department within the Ministry of Trade and Industry. The Project was implemented by the rural electrification project implementation unit within DOP. Following the disaggregation of DOP on 1 July 2002, BPC became the Executing Agency; and implementation was undertaken by the Rural Electrification Department of BPC. The delays in the Project had nothing to do with these disruptions and are noted here only to indicate that it proceeded successfully and within budget under less than ideal managerial conditions.

There were two less successful outputs in project implementation:

- (a) Under the Project, 100 solar panels were procured and distributed to district authorities for installation in remote community centers. While all 100 systems were issued to district administration authorities for installation, there was no further monitoring by the project implementation unit. Because of the lack of records, BPC's project completion report initially indicated that only 76 of the solar panels had been installed by early 2007. One reason for the disparity is that with the extension of the electrical distribution system some of the customers provided with solar panels have subsequently connected to the distribution system. Consequently, some of the solar systems installed under the Project have presumably been relocated.
- (b) The provision of free house wiring kits under the Project to some customers and not others has been unsuccessful (at least in part) for two reasons (i) the limited design capacity of these kits is seen as a barrier to possible future increases in a household's electricity usage, and (ii) many beneficiaries do not like to be identified as poor and in need of charity. While the issue of free village electrification kits was not fully successful, BPC has reported that very few households in the project areas remain unenergized. It is necessary to examine more socially acceptable mechanisms for helping poor households install internal house wiring in future projects.

The impact of these two partly successful outputs is small compared to the number of customers that have been successfully provided with electricity through the Project. Overall, the implementation arrangements are rated satisfactory.

The covenants of the technical assistance loan addressed due diligence of the accounting and financing, legal and institutional, tariff, environment, and social measures with respect to the project implementation. The project performance reports state that the performance of the Borrower on conditions and covenants was satisfactory to highly satisfactory throughout the Project. Of the 16 covenants in the loan agreement, there was only one not complied with at the time of the PCR:

Covenant	Status at time of PCR
Starting from FY2005, the corporatized DOP shall maintain at all times a rate of return of at least 6% on the net revalued fixed assets, debt service ratio of at least 1.5, and self-financing ratio of at least 20%.	Partly complied. BPC's rate of return on assets was 4.6% in 2006. BPC is likely to achieve a rate of return of 6% on net revalued assets for the first time in 2007. Other ratios have been maintained well above the covenanted targets.

The Borrower's response to the covenants shows sincerity and capability in fulfilling its commitments under the loan. Overall, this validation rates the performance of the Borrower on conditions and covenants as satisfactory.

- (v) **Performance of the Borrower and Executing Agency.** Because of the extensive experience of the Executing Agency on electrical distribution work, only nominal consulting services were provided for the loan project. The Borrower and Executing Agency provided all necessary resources for the successful implementation of the Project. Delays were encountered but did not have a significant impact on the project outcome.

In terms of monitoring and evaluation, there were problems with respect to the solar panels. The Executing Agency did no formal monitoring on the location, usage, and usability of the solar panels, so an accurate quantitative assessment of the output and outcome of this component is not possible. The Executing Agency and the ADB Project Completion Review Mission should have provided a more comprehensive statement on the location and usage of the solar panels.

The Executing Agency is proposing, during the Tenth 5-Year Plan, to revisit 4,000 solar panels installed under previous aid programs. The ADB mission was of the opinion that, if this proposal is accepted, the revisited solar panels (which could include those installed under the Project) will be refurbished and returned to full working order.

DOP, with the assistance of international consultants provided under the attached technical assistance, was successfully disaggregated into the Department of Energy and the Bhutan Power Corporation on 1 July 2002.

On balance, the performance of the Borrower and the Executing Agency was satisfactory.²

- (vi) **Performance of ADB.** ADB undertook one inception mission and 10 review missions during the course of the Project. These missions included visits to the head offices of Government, the Executing Agency, and the project site. The Executing Agency acknowledged the value of the assistance of the ADB missions in providing advice on technical issues, procurement, sector reforms, and loan administration, particularly in resolving conflicts with contractors. The question with the realignment of the Executing Agency in the middle of the implementation program. Overall the performance of ADB was satisfactory.

² On a positive note, the PCR reported that BPC recently completed a subsequent rural electrification loan project before the original loan closing date of 31 March 2007, with no extensions or consultancy support. This demonstrated improving performance by BPC in undertaking project implementation and management.

D. Evaluation of Performance (evaluator assessment):

- (i) **Relevance.** Socioeconomic surveys in Bhutan and other developing member countries have underscored the importance of electrification to social development and poverty alleviation in rural communities. At the time of appraisal, the design of the Project—providing rural electrification to achieve poverty reduction—was consistent with the Government's proclaimed objective of 100% electrification throughout the country by 2020. It was also in line with ADB's country strategy for Bhutan. The Project was therefore highly relevant at appraisal. The Project was successfully implemented in accordance with the principles of the appraisal design. As demands or opportunities arose during the course of the Project, the outputs were increased (extending the distribution system to 8,090 customers and providing 100 solar panels compared to 6,010 customers and 28 solar panels in the original loan). Although there were delays in implementation of solar panels and problems in distributing electrification kits and solar panels, the impact of these problems were very small in comparison to that of electrifying 8,090 customers. These problems did not affect the relevance of the design; the Project maintained its relevance throughout and is therefore rated on completion as highly relevant.
- (ii) **Effectiveness in achieving outcome.** To understand the effectiveness of the outcomes, it is necessary to note the achievement in outputs. Extensions to the distribution system provided electricity to 8,090 new rural consumers compared to 6,010 planned at appraisal, a 32% increase in productivity from the appraisal estimate. One hundred solar panels (72 more than the appraisal target) were provided to remote communities. Ten stations (nine substations and one diesel station) were connected to a pilot SCADA system, which was five more than planned at appraisal, and included provision for network control as well as monitoring. Although there was no baseline to use in quantifying the outcomes, it is known from earlier socioeconomic surveys in Bhutan and from the sample survey carried out by the Project Completion Review Mission, that the expected outcomes of income generation and employment, as well as improvements in quality of life, education, and health will be achieved. Since the scope of work increased considerably during project implementation, it follows that these outcomes will be greater in quantity and effectiveness than planned.

Problems did arise in the distribution of solar panels and electrification kits.

- (a) The solar panels were intended for installation in community institutions located in areas remote from the existing grid, where a grid connection was not economically feasible. Once procured, the solar systems were provided to the various district authorities, which were responsible for selecting the appropriate beneficiaries and arranging for installation. There was no formal follow-up by the Executing Agency on the effectiveness or even disposition of the solar panels, however. It is believed that the solar panels have been installed in institutions that met the criteria established under the Project; but, it is expected that some of the panels are no longer required in their original locations, because a grid connection is now available. It is not known whether these systems have been relocated.
- (b) Electrification kits, which were intended to be provided free to poor households, were not well-received for social reasons (item C[iv][b]).

While the outcome for the Project is considered to be less effective than it should have been, considering the large number of customers that have been electrified, the Project is rated effective.

- (iii) **Efficiency in achieving outcome and outputs.** The electrical distribution system, the major physical work of the Project, achieved an economic internal rate of return (EIRR) of 14.9%, which is higher than the 13.0% estimated at appraisal. The EIRR analyses for the solar panels and the SCADA system were not undertaken at appraisal or in the PCR. Since the solar panels and SCADA system account for less than 3% of the cost of the Project and the SCADA system was a pilot project, the EIRR analysis was presumably not considered warranted for the report and recommendation of the President and the PCR. The lack of EIRR analyses for these components is not considered a significant issue in this validation.

The economic analysis undertaken for the PCR was based on consumers' willingness to pay, and it used the same methodology as at appraisal. The economic analysis proved relatively insensitive to changes in input assumptions. In this respect, the actual project outcome was particularly favorable, with the actual capital cost per connected customer about 30% less than estimated at appraisal. The Project is rated efficient.

- (iv) **Preliminary assessment of sustainability.** The sustainability of the Project depends on the Government providing continuing subsidy (i.e., tariff adjustments) to BPC for rural electrification. Inadequate subsidy inputs will quickly result in deterioration of BPC's financial performance. In the PCR, the Project is rated as likely to be sustainable because it is Government policy to ensure that sufficient funds are diverted to BPC to ensure the sustainability of its rural electrification program. The power sector in Bhutan can support the subsidies, given the revenues received from sales of electricity to India and the restructured tariffs for domestic consumption. This validation agrees with the PCR that the sustainability of the Project is likely; nonetheless, it should continue to be monitored by ADB during the course of the loan.
- (v) **Impact (both intended and unintended).** As stated in the PCR, "insufficient project-specific data is available to objectively assess the impact of the Project on beneficiaries." Lacking project-specific or baseline data, the ADB Project Completion Review Mission carried out a sample survey after project completion by visiting one village, and by reviewing the electricity consumption records of two villages at different economic levels. The survey found that project beneficial impacts varied widely, depending in particular on the location of the beneficiary, be it near a town or remote. In general, households use electricity for lighting, but only about 50% of them use it for cooking, and then often only for cooking rice. Other appliances such as water boilers, refrigerators, televisions, and frying pans or curry cookers are less common. Beneficiaries, even in higher-income households, prefer to use fuelwood for space heating and also for the cooking of food other than rice. Thus the ADB Project Completion Review Mission was not able to evaluate the benefits of the Project quantitatively, although it did confirm that the socioeconomic benefits generally attributable to rural electrification were being achieved on this Project. The usage of appliances was not as widespread as considered at appraisal, however.

BPC confirmed that there was no resettlement or land acquisition relating to right-of-way requirements under the Project. The Project also had no significant environmental impacts.

Financial and management autonomy has been achieved with the disaggregated and corporatized DOP, now the Department of Energy and the Bhutan Power Corporation.

Overall the impact of the Project is considered substantial.

E. Overall Assessment, Lessons, and Recommendations (evaluator assessment)

- (i) **Overall assessment.** The Project is relevant now as at the time of appraisal. The project outputs (8,090 households connected, 76 solar panels installed, the SCADA system operating, and the DOP restructured) were satisfactory to highly satisfactory. The delays in implementation, although significant, were eventually brought under control such that the electrical distribution systems (the main component of the Project) were completed ahead of schedule and within budget. The revised EIRR is favorable, and the Project is likely to be sustainable given the Government's position on rural electrification and the recognition that appropriate subsidy inputs are required. The design miscalculations were a singular issue that did not detract from the value of the Project. Much was accomplished in capacity building, and there is more effective use of human resources through the introduction of the SCADA system for monitoring and control of part of the power network around Thimphu. Financial and management autonomy has been achieved with the disaggregated and corporatized DOP—now the Department of Energy and the BPC. Overall, the technical assistance loan is evaluated as highly successful.

(ii) **Lessons.** The two issues identified in the PCR as lessons to be learned were:

- (a) The provision of free house wiring kits by the Project to some customers (identified as poor households) and not others has only been unsuccessful for two reasons, as explained in item C[iv][b]. More socially acceptable mechanisms for helping poor households to install internal house wiring should be examined for future projects.
- (b) Apparently the whereabouts of about 24 solar panels (out of 100) were not known at the time of the ADB Project Completion Review Mission (item C[iv][a]). Any future projects that include the provision of solar panel lighting systems should be designed so that (i) appropriate beneficiaries are targeted, (ii) installation activities are recorded and monitored to ensure that the systems are correctly installed and operational at the end of the project, and (iii) processes are designed and implemented to ensure that the Project is sustainable and that systems are properly maintained over time.

A third lesson to be learned relates to the design of electrical distribution projects.

- (c) Considering the number of distribution systems that ADB has financed and designed over the years, errors of more than 100% in estimating the electricity demand (132 kWh per month per household design versus 49 kWh per month per household actual) and an underrun of 30% on the unit cost of solar panels (\$1,454 actual versus \$2,080 estimated at appraisal) are not acceptable design practice. More accurate estimating is needed for future projects.

(iii) **Recommendations.** This validation agrees with the recommendations in the PCR as paraphrased below, or as specifically noted otherwise.

(a) Project-related recommendations

- (1) The only loan covenants requiring ongoing monitoring are the key financial covenants and the requirement for regular submission of audited financial accounts. Agreed.
- (2) During the course of the loan, the sustainability of the Project, i.e., tariff subsidy for poor consumers, should continue to be monitored by ADB through review of the audited financial reports. Agreed.

(b) General recommendations

- (1) Any socioeconomic study undertaken during project preparation should be designed with the objective of providing baseline data for future use. Furthermore, the monitoring and assessment of project outcomes should be systematically developed. Agreed.³
- (2) ADB and the Borrower should find an alternative mechanism (other than electrical kits) for supporting the energization of the poorest rural households. Agreed.
- (3) ADB and the Borrower need to develop a process to provide for the effective sustainability of solar panels in villages where grid connection is not feasible. Agreed.⁴

(c) Recommendations by this validation supplementary to the PCR

- (1) ADB should review how (a) miscalculations of more than 100% in estimating the electricity demand, and (b) an underrun of 30% on the unit cost of solar panels happened on this Project. (For example: Did the market change during the implementation period? Was the distribution plan designed by an electrical engineer?) ADB should consider better design practices for ADB-financed electrical distribution projects.
- (2) As a matter of good management and administration, ADB should request the Executing Agency to account for all of the 100 solar panels provided through the loan.

³ This validation agrees with the project completion report recommendations on this item; however, the recommendations are just normal good practice and should be expected, without prompting, on every project.

F. Monitoring and Evaluation Design, Implementation, and Utilization (evaluator assessment)

- (i) **Design and Implementation.** As a basis for the design and formulation of the Project, a project preparatory technical assistance carried out a socioeconomic survey covering households both with and without electricity in the project areas. On the basis of this data and in close consultation with the individual district administrations and ADB, the Government finalized its selection of rural villages proposed for electrification.
- (ii) **Utilization.** Project activities and milestones, and particularly covenants, were well-monitored with the ADB review missions and cooperation from the Executing Agency, which resulted in an overall successful Project.

The project design does not appear to have incorporated monitoring and evaluation after project completion. The PCR reported that “insufficient project-specific data is available to objectively assess the impact of the Project on beneficiaries.” The report and recommendation of the President does not mention any monitoring and evaluation in the design beyond project implementation. Lacking baseline data, the ADB project completion review mission carried out a sample survey of the project beneficiaries after project completion to assess the socioeconomic benefits.

Although monitoring and evaluation is important, this validation is of the view that it is not essential to carry out high-level post-project monitoring and evaluation for every project. Costs, staff availability, and benefits should be considered in any plan to establish a monitoring and evaluation program.

G. Other (safeguards, including governance and anticorruption; fiduciary aspects):

BPC confirmed that there was no resettlement or land acquisition relating to right-of-way problems under the Project. The Project also had no significant environmental issues. BPC even attempted to minimize small negative environmental impacts. For example, limiting distribution transformers to those rated to 160 kVA meant these small transformers could be pole mounted, thereby avoiding the need to acquire land for fenced enclosures.

Under the covenants (PCR, Appendix 6, item 11), the Borrower and the Executing Agency were bound to ensure that all environmental laws, regulations, guidelines, and standards were complied with during the project construction and operational stages. The PCR indicated that this covenant was complied with.

Governance, anticorruption, and fiduciary issues were not within the scope of work for the loan, but the loan and all of the consultant and equipment contracts were subject to the standard ADB provisions on these subjects and have been monitored through the ADB review missions. There were no serious problems identified during the course of the Project on these issues.

As reported in the PCR, twenty-four out of 100 solar panels supplied for distribution have not been accounted for. This is considered a deficiency in the Executing Agency administration rather than misuse of project materials. Nonetheless, as good management and administration, the Executing Agency should be requested to account for these panels.

8. Ratings:	PCR	OED Review	Reason for Disagreement/Comments
Relevance:	Highly Relevant	Highly Relevant	
Effectiveness in Achieving Outcome:	Effective	Effective	

⁴ These requirements are being studied under the ongoing advisory technical assistance.

Efficiency in Achieving Outcome and Outputs:	Efficient	Efficient	
Preliminary Assessment of Sustainability:	Likely	Likely	
Performance of Borrower and Executing Agency:	Satisfactory	Satisfactory	
Performance of ADB:	Satisfactory	Satisfactory	
Impact:		Substantial	The PCR reports that “insufficient project-specific data is available to objectively assess the impact of the Project on beneficiaries.” The PCR did conclude, however, that (i) there were minimal negative environmental impacts from the physical works, (ii) based on the sample survey, the project benefits were being achieved, and (iii) the benefits were greater than initially designed at appraisal. Therefore, this validation considers the impact as substantial.
Overall Assessment:	Successful	Successful	Extending the distribution network to 8,090 households, plus providing up to 100 solar panels for remote areas and being within budget warrants a successful rating.
Quality of PCR:		Satisfactory	See comments on PCR quality below.

ADB = Asian Development Bank, OED = Operations Evaluation Department, PCR = project completion report

H. Comments on PCR Quality:

The PCR is well-written and complete in content. Substantial documentation and analysis have been provided to support the recommendations. One minor comment is that the recommendations in the PCR contain considerable discussion, which should better be in the body of the report, with more concise statements in the recommendations.

This validation has only one significant difference with the position of the PCR. It is this validation's view that the selection of the energy demand of new users in rural areas and the cost estimate for the electrical distribution systems were serious miscalculations in design and should have been treated as such in the PCR—in lessons to be learned and in the recommendations with the purpose of improving future design practice.

Overall, the PCR is rated satisfactory.

REGIONAL DEPARTMENT'S RESPONSE TO THE PROJECT COMPLETION REPORT VALIDATION REPORT

On 17 January 2008, Director, OED2, Operations Evaluation Department (OED), received the following comments from the Energy Division, South Asia Department.

We appreciate OED's providing us with the draft Project Completion Report (PCR) Validation Report for Loan 1712-BHU: Sustainable Rural Electrification Project. The report is very comprehensive and informative. We are pleased to find that the report rated the overall project assessment as "successful". We appreciate having OED's support and advice.