

Performance
Evaluation Report

Cambodia: (Cambodia) Power Transmission Lines Co., Ltd., Power Transmission Project



Independent
Evaluation



**Performance Evaluation Report
December 2013**

Cambodia: (Cambodia) Power Transmission Lines Co., Ltd., Power Transmission Project

Reference Number: PPE:CAM 2013-14
Project Number: 40914
Investment and Loan Numbers: 7256-CAM
and 2337-CAM
Independent Evaluation: PE-764

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Evaluation 

NOTES

- (i) The fiscal year (FY) of (Cambodia) Power Transmission Lines ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

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Abbreviations

ADB	–	Asian Development Bank
CPTL	–	(Cambodia) Power Transmission Lines
EAC	–	Electricity Authority of Cambodia
EDC	–	Electricité du Cambodge
EGAT	–	Electricity Generating Authority of Thailand
EIRR	–	economic internal rate of return
ESHS	–	environmental, social, health, and safety
FIRR	–	financial internal rate of return
GMS	–	Greater Mekong Subregion
IED	–	Independent Evaluation Department
IEIA	–	initial environmental impact assessment
LIBOR	–	London interbank offered rate
PPA	–	power purchase agreement
PPP	–	public–private partnership
PTA	–	power transmission agreement
PSOD	–	Private Sector Operations Department
RRP	–	report and recommendation of the President
SSPA	–	share sale and purchase agreement
WACC	–	weighted average cost of capital

Weights and Measures

GW	–	gigawatt
GWh	–	gigawatt-hour
km	–	kilometer
kV	–	kilovolt
kWh	–	kilowatt-hour
MW	–	megawatt
MWh	–	megawatt-hour

Currency Equivalents

Currency Unit – Riel (KR)

	At Appraisal (1 April 2007)	At Completion (11 December 2007)	At Independent Evaluation (October 2013)
KR1.00 =	\$0.00024	\$0.00024	\$0.00024
\$1.00 =	KR4,163	KR4,163	KR4,060

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Contents

Acknowledgements	vii
Basic Data	ix
Executive Summary	xi
Chapter 1: The Project	1
A. Project Background	1
B. Key Project Features	2
C. Progress Highlights	3
Chapter 2: Evaluation	7
A. Project Rationale and Objectives	7
B. Development Outcomes and Impact	8
C. ADB Investment Profitability	13
D. ADB Work Quality	13
E. ADB Additionality	15
F. Overall Project Rating	16
Chapter 3: Issues and Lessons	17
A. Issues	17
B. Lessons	17
Appendixes	
1. Private Sector Development Indicators and Ratings	21
2. (Cambodia) Power Transmission Lines Ownership	23
3. Summary of Evaluation Mission Interviews with Local Users	24

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Cover photo taken by Lauren Hauck.

Basic Data

Investment 7256-CAM/Loan 2337-CAM

Key Project Data	As per RRP (\$ million)	Actual (\$ million)
Total project cost	\$32.0	\$33.5
ADB investment	\$8.0	\$7.0

Key Dates	Date
Concept clearance approval	9 February 2006
Board approval	27 June 2007
Loan agreement	31 January 2008
Loan effectiveness	29 July 2008
First disbursement	4 August 2008
Commercial operation date	23 November 2007 ^a
Loan repayment date	21 February 2013 ^b

Mission Data	Number of Missions	No. of Person-Days
Due diligence	3	5
Loan negotiations	2	22
Project administration	3	18
Extended annual review mission	1	9

ADB = Asian Development Bank, RRP = report and recommendation of the President.

^a Commercial operations began before loan effectiveness due to delays in finalizing the financing structure.

^b (Cambodia) Power Transmission Lines refinanced its debt in the local markets and repaid the senior debt early.

Executive Summary

In 2006, Cambodia reported that only 18% of households in the country had access to electricity and that Cambodia's electricity prices were the highest in Southeast Asia. More than 95% of power was supplied by isolated, small generation systems running on imported diesel fuel, and these distribution networks reported power losses as high as 32% in rural areas. Ongoing efforts to increase the national power supply resulted in a power purchase agreement (PPA) signed in 2002 between the governments of Cambodia and Thailand. The PPA allows Cambodia to import power from Thailand and to deliver it over a high-voltage transmission line to Cambodia's Siem Reap, Battambang, and Banteay Meanchey provinces; this line is the first link in the planned national electricity grid. In 2005, the 30-year build-operate-transfer concession for the high-voltage line under a public-private partnership (PPP) was awarded to the entity that became (Cambodia) Power Transmission Lines (CPTL). The terms of the concession are documented in the power transmission agreement (PTA).

In June 2007, the Board of Directors of the Asian Development Bank (ADB) approved a loan of up to \$8 million from ADB's ordinary capital resources to CPTL to fund construction of the 221-kilometer, 115 kilovolt (kV) high-voltage line to transmit power as agreed under the PPA and PTA (the CPTL project). Loan documents were signed in January 2008, by which time ADB was able to reduce its loan amount to \$7 million; CPTL negotiated a subordinated debt tranche that reduced the senior debt needed toward the \$33.5 million final project cost. The CPTL project is ADB's first private sector investment in Cambodia and the project's resultant power supply brought Cambodia's northwest into a new era of economic development.

The CPTL project is evaluated according to ADB's Guidelines for Preparing Performance Evaluation Reports on Nonsovereign Operations to give an overall rating of *highly successful* based on four criteria: (i) development impact and outcome, (ii) ADB investment profitability, (iii) ADB work quality, and (iv) ADB additionality.

The rating for development impact and outcome is *excellent*. Four subcriteria support this rating: (i) private sector development (rated *excellent*); (ii) business success (rated *satisfactory*); (iii) economic development (rated *excellent*); and (iv) environmental, social, health, and safety (ESHS) performance (rated *satisfactory*).

The private sector development rating is *excellent*. Power sourced from Thailand to Cambodia via the CPTL line supplies power to the Banteay Meanchey grid operated by Electricité du Cambodge (EDC). Since December 2007, this grid has connected customers in Siem Reap, Banteay Meanchey, and Battambang provinces to cleaner, less expensive, and continuously running power. In 2011, power consumption drawn from the CPTL line was twice the base-case forecasts made by ADB and other lenders that ADB attracted to the project, indicating the dramatic increase in economic activity supported by electricity in all three provinces and a direct flow-on benefit from the project. The number of customers served directly by EDC using grid power increased by 88% from 39,891 in 2006 to 74,997 in 2011. Grid connections also expanded to 31 independently operating licensees by year-end 2011, increasing customers served through licensees by 332% since 2006. EDC's revenues and profits have increased while its tariffs have decreased by 11.8%; on-grid licensee tariffs have

decreased by 51.2%. The much smaller on-grid licensees onsold 6% of the 2011 grid power supply to serve nearly 50,000 customers that EDC's resources cannot reach, and they are an important part in the increasing regional electrification.

EDC has used experience from the successful CPTL project to develop new high-voltage lines, including two more that are privately owned and began operations through PPP arrangements in January 2013. The CPTL project is also an important component of the Greater Mekong Subregion (GMS) energy sector development initiatives supported by ADB.

The rating for business success is *satisfactory*. The primary indicator for business success compares CPTL's real financial internal rate of return (FIRR) with the real weighted average cost of capital (WACC).

The rating for economic development is *excellent*. This result reflects the significant reduction in costs to end-users for nonincremental power, as well as the lower-cost incremental power that the project supplied to the provinces.

The rating for ESHS performance is *satisfactory*. Working with ADB and ESHS consultants during construction and prior to financing, CPTL developed a documented plan for environmental and resettlement issues, specifically designed and budgeted to meet ADB's policy requirements. The line's route was designed to minimize disruption and CPTL carried out ADB's requirements with notifications and meetings in communities, and paid compensation to affected persons in compliance with ADB policy. ADB's grievance mechanism was explained. ADB's policy went beyond government legislation at the time—Land Law (2001)—to include entitlements for all affected persons even in the absence of land title. To obtain private sector funding from ADB, CPTL complied with ADB policy. Ongoing activities are monitored for ESHS issues. The project has been smoothly implemented through villages all along the line's route.

ADB's investment profitability is rated *satisfactory*. ADB led the loan transaction development and appropriate pricing was an element in attracting other lenders. Pricing accurately reflected the relative risks of the Cambodian market and was appropriate for the transaction.

ADB's work quality is rated *excellent*. The CPTL transaction reflects well on ADB's efforts across a range of departments over a prolonged period to support Cambodia's energy sector. Three subcategories support this rating: (i) screening, appraisal, and structuring; (ii) monitoring and supervision; and (iii) ADB role and contribution.

The rating for screening, appraisal, and structuring is *excellent*. Upon approach from CPTL, the Private Sector Operations Department (PSOD) took the lead in due diligence and financial structuring, and in attracting other investors and ensuring that ADB's ESHS requirements were understood and documented. Analysis of electricity demand, all parties and contracts involved in its delivery, and consideration of the parties' ability to deliver the contracted obligations of new cross-border PPP arrangements were part of the screening process. ADB delivered project financing of the highest standards to protect lenders from risks to the extent possible and to support the development goal of electrification.

The rating for monitoring and supervision is *excellent*. Through the lenders' engineer, ADB monitored the technical, environmental, maintenance, and social

matters throughout the life of the loan through the timely, thorough reports of the lenders' engineer. Financial controls and budget monitoring by ADB also served the company well, especially through the 2010 shareholders' dispute. PSOD worked to understand the situation in the local context and to allow CPTL to resolve its management issues while reserving the rights of lenders. CPTL's physical operations and the successful performance of the new management were monitored closely during the transition period. Results monitoring also confirmed the amount of performance-based early debt repayments required under the financing structure, whereby excess cash flows were applied to early repayment of senior debt.

The rating for ADB role and contribution is *excellent*. The transaction set an important Cambodian project finance benchmark. ADB's institutional contribution to Cambodia's energy sector development is also noted and contributes to the *excellent* rating for development.

The rating for ADB additionality is *excellent*. Without ADB participation, CPTL would not have been able to attract the long-term debt financing as required for the project. CPTL's interest in ADB's participation led directly to compliance with ADB's environmental and social policy requirements. The project was smoothly implemented through villages across the 221-kilometer route of the line, where disruptions might have occurred had the communication and compensation work not been done so well. Further, ADB played a key role in keeping the lenders together during the shareholders' dispute.

Issues

The final closeout report on the social protection compensation payments to landowners has not been submitted. Although the lenders' engineer advised that the majority of required payments were completed by 2009, records documenting a portion of the final payments were lost in the 2010 management transition and the final closeout report was not completed. The project was completed in two stages and the lenders' engineer had been able to document all but a small portion of compensation for the second stage. The first-stage budget was \$870,000 for 1,417 affected persons; the second-stage budget was \$321,550 for 1,098 affected persons. The Independent Evaluation Department estimates the undocumented payments to be \$67,000, approximately 5.6% of the budget of \$1,191,550 for the entire project. The vast majority of compensation over both stages was made for the loss or relocation of trees and for the small plots of land required for pole installation. The Independent Evaluation Department estimates that of the total 2,515 affected persons, 2,180 received compensation for trees that were relocated for safety reasons. Compensation was also made for four homes and two sheds purchased during the first stage of construction, and compensation payment and satisfaction with these arrangements was documented both by ADB and the independent consultant. CPTL worked with the resettlement audit team when the audit was done, providing all information in hand at the time.

CPTL advised the evaluation mission that there are no outstanding claims, and given the passage of time since construction was completed in 2007, the risk of any new claims appears remote. The regulator, Electricity Authority of Cambodia (EAC), also confirmed that there have been no issues with CPTL's compliance with regulations. ADB has no records of complaints or concerns. Based on all of the available information it is reasonable to conclude that the required payments were made but the records were

lost, and apart from the missing records and closeout report there are no outstanding issues.

Lessons

Long-term sector engagement facilitated the enabling environment. Since 1992, ADB's Cambodia country strategy has continuously focused on the energy sector (in coordination with other donors, especially with the World Bank, and with government interests). These efforts contributed to the 2001 Electricity Law that codified the sector's regulatory agencies. ADB has made a significant contribution to the GMS energy framework, and ADB technical assistance in the 1990s considered the feasibility of the proposed interconnection from Thailand to Battambang. ADB also extended considerable assistance to the Ministry of Industry, Mines, and Energy; EDC; and EAC for training and capacity building as well notable support to EAC for tariff reform and guidelines for effective monitoring of licensees. ADB's long-term sector focus contributes to Cambodia's ability to attract private sector investment and PPPs. The CPTL project has a meaningful demonstration effect when all parties fulfil their contracted obligations. CPTL delivered the line on time and to agreed specifications. The Electricity Generating Authority of Thailand (EGAT) delivers electricity to EDC via CPTL. EDC meets its payment obligations to EGAT and CPTL, and delivers electricity to its customers and licensees. EAC monitors tariffs and licensees, ensuring that project benefits are passed through to the end-user. PPP investments require development and performance across all the project elements, and this was achieved with the CPTL project.

Additional resident mission resources could aid in due diligence. Whether the 2010 shareholders' dispute could have been prevented through a change in due diligence procedures requires consideration. It is noted that the dispute appears to be resolved because ADB's evaluation mission was advised that the final appeals process regarding the ownership transfer had ended in December 2012. All existing due diligence requirements appear to have been completed, and PSOD also used an external consultant and included the resident mission in due diligence, even without a formal requirement to do so. The due diligence appears to have used all reasonable avenues (combined with direct experience observing all parties participate in many months of work and negotiation toward a well-documented transaction) and suggests that there was no more information to be gathered at entry. The dispute occurred years after transaction development was completed and it does not seem possible to have foreseen this situation, indicating the limits of what due diligence can achieve. However, reviewing the project did turn up a potential enhancement that could be added to resident mission resources—without a formal requirement to include the resident missions in due diligence, it is difficult for them to dedicate staff to the specific function of due diligence and maintain databases about potential project sponsors that might be able to provide additional knowledge and insight to those making investment decisions. If additional resources are allocated to resident missions and specifically dedicated to sponsor due diligence they could further strengthen the process, with a report based on ADB's own local knowledge complementing the reports from external consultants.

Controls over project cash flows and bank accounts protect project interests. The loan structuring included strict controls over the project bank accounts. Bank accounts specifically dedicated to the CPTL project are required to be maintained both outside the host country (the offshore account) and within it (the onshore account). All amounts payable to the project are paid into the offshore account and

may only be withdrawn according to the payment priorities and amount limits specified in the loan document. The importance of achieving these protections is noted as a critical point of transaction risk mitigation.

Project sponsors can identify qualified local maintenance providers. CPTL's international maintenance provider departed with the majority shareholders and was successfully replaced with a local provider. If the project sponsors or management teams are able to find suitably qualified, locally based operations and maintenance solutions, an important opportunity to create skilled jobs is created from the outset. During the evaluation mission it emerged that often where international equipment and financiers are involved, there is a perception among project sponsors that international maintenance providers are required. Where sponsors put forward local maintenance providers, ADB may be well placed to take a leadership role in considering local maintenance providers alongside international providers through ADB's due diligence with lenders' engineers. It is the sponsors who select the parties to implement the projects, not ADB, and quality maintenance is a critical element of a successful project. Therefore, the suggestion is simply to check early in the project development process that project sponsors understand that ADB will consider a range of options to deliver a successful project.

Guardrails might mitigate against transmission line accidents. The CPTL line is adjacent to the regional highways and by necessity the poles are close to the roads. During the evaluation mission there was a vehicle accident that required 10 poles to be replaced. Nobody was hurt, and the CPTL-EDC emergency response was effective, but Siem Reap was without power for 4 days. Guardrails might mitigate against future accidents; there are no guardrails along the road where the accident happened. It is acknowledged that this recommendation is a bit more complex to implement than it might appear; it requires determination of guardrail specifications and of which party approves, pays for, and maintains the guardrails. A complete cost-benefit analysis would also be required because this is the first accident of this kind with the CPTL line in 5 years of operations, but a conscious decision about guardrails might serve the interests of future projects well.

Emergency power plans are outdated. During grid outages, Siem Reap is served by EDC's 10.5-megawatt diesel power plant and customers' own generator sets. Those connected to the backup plant suffer rolling brown-outs. However, many are not connected to the backup plant, nor do they have their own generators, leaving them with no power (and often, no water) at all. For a major outage these plans are inadequate. The economy and the expectations have changed dramatically in the 5 years of grid power and emergency plans need to evolve. There may be an opportunity for an ADB public sector project to support development of emergency plans and power plants dedicated to emergency power supply.

Vinod Thomas
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CHAPTER 1

The Project

A. Project Background

1. In 2006, Cambodia reported that only 18% of households in the country had access to electricity and that Cambodia's electricity prices were the highest in Southeast Asia. More than 95% of the power available was supplied by isolated, small generation systems running on imported diesel fuel, and distribution networks reported power losses as high as 32% in rural areas.¹ Providing reliable, less expensive power throughout the country is an important goal of the Government of Cambodia.²

Providing reliable, less expensive power throughout the country is an important goal of the Government of Cambodia

2. From the early 1990s, the Asian Development Bank (ADB) and the World Bank worked with the government to support development of the power sector's strategy, regulations, ministries, and utility. With the eventual signing of the Electricity Law in 2001, entities with clear roles and authorities were created. This law covers all activities related to the supply, the provision of services, and use of electricity and other associated activities of the power sector. The law also includes a clear definition of roles and the establishment of independent operations by the entities in the power sector—the Ministry of Industry, Mines, and Energy (established in 1992) is responsible for policy and strategy; the Electricity Authority of Cambodia (EAC, established in 2001) issues regulations and licenses, reviews costs, approves tariffs, and regulates compliance; and Electricité du Cambodge (EDC) is the state utility, operating since 1996 as a state-owned, limited-liability corporate entity with its own administrative financial and managerial authority. In 2001, EAC issued the first license to EDC.

3. ADB and the World Bank also worked with the government to develop Phnom Penh's first two small-scale power plants, providing 20 megawatts (MW) of power to the city by 1996. Other independent providers and international donor community contributions followed, bringing the total power available for Phnom Penh to 184.5 MW by 2006. Over the same period, state authorities undertook 48 additional, separate projects to provide 63.25 MW to areas outside Phnom Penh, bringing Cambodia's total available power supply to 247.75 MW by 2006. Although this represented considerable progress, 82% of households were still without access to power and those that had access were receiving expensive, unreliable power (para. 1).

4. In 2002, the governments of Cambodia and Thailand signed a power purchase agreement (PPA) that allowed Cambodia's EDC to import power from the Electricity Generating Authority of Thailand (EGAT) via a transmission line to Cambodia's Siem Reap, Battambang, and Banteay Meanchey provinces.

5. On 29 April 2005, a 30-year build–operate–transfer concession for the transmission network under a public–private partnership was awarded to the entity

¹ Electricity Authority of Cambodia (EAC). 2007. *Report on Power Sector of the Kingdom of Cambodia for the Year 2006*. Phnom Penh.

² The government's goal for rural electrification are: i) by 2020, all villages in Cambodia have access to electricity at any time; and ii) by 2030, at least 70% of all households have access to grid-quality electricity (from EAC's 2012 report on the power sector for the year 2011).

that became (Cambodia) Power Transmission Lines (CPTL). The project was originally to have been developed and built by a joint venture between EGAT and EDC. EGAT later passed on the opportunity to Electricity Generating Company, listed in Thailand and part-owned by EGAT, but the company forwent the opportunity. A.S.K. Co Ltd, a Cambodian company that is part of the SKL Group, later developed the project and entered into a power transmission agreement (PTA) with EDC. Thus, the project represents a negotiated transaction. A.S.K. subsequently novated the PTA to CPTL.³

6. To meet the deadline for the start of electricity transmission, financing transaction development and project construction were undertaken in parallel. Construction began in January 2006 and the concept clearance paper of ADB's Private Sector Operations Department (PSOD) was approved in February 2006. ADB was a joint lead arranger for the financing, leading both due diligence and financial structuring. Technical, environmental, and social due diligence began in March 2006, and CPTL management worked with a consultant appointed to act on behalf of the lenders to complete the project in compliance with ADB policy requirements.

7. In June 2007, the ADB Board of Directors approved a loan of up to \$8 million from ADB's ordinary capital resources to CPTL (footnote 3) to fund construction of the transmission line, built by PES International after a competitive international tender. Thai-based PES had extensive experience building similar facilities for Thailand's Provincial Electricity Authority, among others. The line was commissioned in November 2007 and electricity began being delivered to customers on 1 December 2007, as required by EDC.

8. Loan documents were signed in January 2008.⁴ ADB led a lender group that provided two tranches of debt.

9. In February 2013, CPTL successfully refinanced its debt in the Cambodian local market and fully repaid its 2008 loans. The CPTL project is ADB's first private sector investment in Cambodia.

B. Key Project Features

10. **Physical.** The CPTL project contained three construction elements: (i) 221 kilometers (km) of single-circuit, 115 kilovolt (kV) power transmission line; (ii) one 115 kV switching station; and (iii) three 115 kV/22 kV substations. Power is purchased from EGAT and imported by EDC into Cambodia from Thailand's Aranyaprathet 115 kV/22 kV substation (15 km inside the Thai border). The delivery point is at the Thailand–Cambodia border, where the CPTL transmission line begins and runs through a switching station at Industrial Estate (4 km inside the Cambodia border) to Banteay Meanchey. At Banteay Meanchey the line splits into two lines, one running east to Siem Reap, the other running south to Battambang. The substations at Siem Reap, Battambang, and Banteay Meanchey convert the power to 22 kV for supply to end-users.

³ ADB, 2005, *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the (Cambodia) Power Transmission Lines Co., Ltd. for the Power Transmission Project in Cambodia*, Manila.

⁴ Long-term debt financing was contemplated from the outset of project development but financing could not be finalized until the Ministry of Economy and Finance (MEF) confirmed its position on providing MEF guarantees for EDC obligations. In March 2007, MEF confirmed that it would guarantee EDC obligations for generation projects, but not for transmission projects. Given the agreed timing for construction completion, construction had begun while the financial structuring was ongoing, with the understanding that subject to agreed conditions, long-term debt financing would be provided.

11. **Public–private partnership arrangements.** A key feature of this first-in-kind public–private partnership (PPP) for Cambodia is the contractual arrangements confirming volumes and prices to be paid by EDC for delivery received from EGAT and CPTL. These documented legal commitments have been honored by all parties from the start of delivery in 2007. EGAT and CPTL have delivered electricity and EDC has made all payments on time. The success of these contractual arrangements is a critical demonstrator for attracting future projects to Cambodia. EDC’s capacity to document and administer the growth of its operations has directly benefitted from the experience of developing and these contracts and meeting their obligations. The cooperation between Thailand’s and Cambodia’s governments and agencies is also an important element of the Greater Mekong Subregion (GMS) energy cooperation. The CPTL line was the first privately owned high-voltage line in the GMS.

12. **Lower and stable costs.** The stable, relatively low-cost interconnected power supply has allowed EDC to reduce and maintain the rates to its customers while making a profit, and EDC has nearly doubled its customer base in these three provinces over 2006–2011.⁵ EDC’s resulting profits are used in part to finance its ongoing work toward national electrification. It is important to recognize that the CPTL transmission line is a critical piece of infrastructure operating in the context of other projects, including the Banteay Meanchey grid, which is owned by EDC and delivers power from the CPTL line to customers.

13. **Cleaner power.** The clean, continuous power that the project provides is also an important feature in that it displaces independently operating generation sets that are powered by diesel fuel and fuel oil delivered in tanker trucks. Through the Banteay Meanchey grid, the CPTL project has provided 1,373 megawatt-hours (MWh) of power that would otherwise have been provided through generation sets by delivering cleaner power from EGAT’s national grid. EGAT’s grid is supplied by power generated by both EGAT’s own generation and EGAT’s purchases from independent power producers. These generators supply the EGAT grid with power generated from fuel types as follows: gas (54%); hydro (18%); renewables and bio fuels (5%); lignite (12%); bitumen (12%).⁶ All of these fuel types are cleaner than stand-alone diesel-generated power.

C. Progress Highlights

14. **Volume transmitted.** The project began supplying electricity to end-users on 1 December 2007. Through the Banteay Meanchey grid, the CPTL project supplies end-users in Siem Reap, Battambang, and Banteay Meanchey, and volumes supplied have grown rapidly in all three provinces. In November 2011, Pursat was added to the grid through the Battambang substation. By 2011, delivered electricity volumes were double those forecast in the report and recommendation of the president (RRP) (footnote 3) under the lenders’ base case (Table 1). Over the life of the line, 1,373 MWh have been delivered, displacing the equivalent diesel or fuel oil generation.

⁵ Tables 2 and 3 detail the customer base and tariffs.

⁶ EGAT. 2013. *www.egat.co.th. System Installed Generating Capacity (July 2013)*. Bangkok.

Table 1: Total Energy Transmitted
(kilowatt-hour)

	2007 ^a	2008	2009	2010	2011 ^c	2012
Siem Reap	10,113,000	136,485,000	164,067,200	192,642,600	212,788,100	N.A.
Battambang	1,986,100	32,261,450	38,247,900	49,711,040	67,768,990	N.A.
Banteay Meanchey	1,005,850	14,161,770	19,121,950	24,602,590	28,338,220	N.A.
Total actual	13,104,950	182,908,220	221,437,050	266,956,230	308,895,310	
Total projected ^b	50,800,000	108,500,000	124,300,000	137,300,000	151,800,000	
Actual projected	0.26	1.69	1.78	1.94	2.03	

^a 2007 is December only; EAC reports that 2007 full-year sales by EDC for Siem Reap were 71 GWh.

^b Source: Lenders' base case, CPTL Independent Engineer report August 2006 (converted from GWh to kWh for ease of comparison).

^c Source: EAC 2012 report for 2011. N.A. = not available, CPTL = (Cambodia) Power Transmission Lines, EAC = Electricity Authority of Cambodia, EDC = Electricité du Cambodge, GWh = gigawatt-hour.

15. **Customers added.** Although the end-users in Siem Reap consume a much greater volume due primarily to the province's vital tourism sector—the airport, large and small hotels, restaurants, electronic ticketing and payment systems, and popular marketplaces all require continuous power—the number of customers connected to the grid has grown significantly and fairly evenly across all the provinces served. Table 2 shows the distribution of customers by province and by licensees. EDC is a licensee and there are additional licensees that serve areas where EDC's resources are not available. In total, 32 licensees distribute power from the grid (on-grid licensees) and 32 licensees continue to distribute power from their own generation units (off-grid licensees). The table categories distinguish EDC (60% of on-grid customers) from all other on-grid licensees (40% of on-grid customers). All licensees are shown according to the 2011 source of power, i.e., those that had migrated 100% of their customers to grid-sourced power by 2011 are included in on-grid. Licensees that began services after 2006 are also included in the 2011 figures. Licensees in Pursat were able to join the grid in November 2011 when EDC approved a network expansion from Battambang to Pursat.

Table 2: Banteay Meanchey Grid Customers – Pre-Grid 2006 v. Post-Grid 2011

	2006	2011	Percentage Increase	Share of All 2011 Customers
On-Grid Licensees				
EDC				
Siem Reap	13,717	26,156	91%	
Battambang	17,117	32,756	91%	
Banteay Meanchey	9,057	16,085	77%	
Total EDC	39,891	74,997	88%	52%
Other On-Grid Licensees as of 2011				
Siem Reap	910	3,537	289%	
Battambang	3,335	27,976	739%	
Banteay Meanchey	1,119	6,973	523%	
Pursat	6,191	11,466	85%	
Total Other Licensees	11,555	49,952	332%	35%
Total On-Grid	51,446	124,949	143%	87%
Off-Grid Licensees				
Siem Reap	2,303	8,377	264%	
Battambang	450	1,705	279%	
Banteay Meanchey	762	4,920	546%	
Pursat	1,762	4,219	140%	
Total Off-Grid	5,277	19,221	264%	13%
Total All Customers	56,723	144,170	154%	100%

EDC = Electricité du Cambodge.

Source: Electricity Authority of Cambodia—reports on the power sector for 2006 and 2011.

16. **Lower prices, greater efficiency.** The pricing and line loss data are a compelling illustration of the grid's benefit (Table 3). EDC has decreased its charges by 11.8% on average. Other licensees that migrated to the grid have decreased charges by 51.2% on average. The average on-grid price is KR1,213 per kWh, while the average off-grid price is KR3,149 per kWh, 2.6 times higher. Further, while on-grid licensees have been able to dramatically reduce charges, off-grid prices increased by an average of 8.2%. This analysis is done using the rates charged for the smallest customers; larger customers pay lower rates and the analysis would yield similar results.

17. The line loss data is a measure of distribution efficiency; lower losses indicate higher efficiency. All licensees have increased their efficiency significantly since 2006. On-grid licensees benefit from the grid, while off-grid licensees have improved operations to comply with EAC license requirements. However, on-grid licensees averaged line losses in 2011 of 12.7%, whereas off-grid licensees averaged 17.99%.

Table 3: Prices and Line Losses^a – Pre-Grid 2006 v. Post-Grid 2011

	Pricing (KR per kWh)			Line Losses (%)		
	2006	2011	Change (%)	2006	2011	Change (%)
On-Grid Licensees						
EDC						
Siem Reap	870	820	(5.7)	13.17	12.54	(4.8)
Battambang	1,132 ^b	1,000	(11.7)	20.24	12.54	(38.0)
Banteay Meanchey	1,220	1,000	(18.0)	25.72	12.54	(51.2)
Other On-Grid Licensees						
Siem Reap	2,800	1,425	(49.1)	28.90	17.80	(38.4)
Battambang	2,690	1,273	(52.7)	34.97	10.30	(70.5)
Banteay Meanchey	3,275	1,200	(63.4)	27.65	9.39	(66.0)
Pursat	2,933	1,775	(39.5)	28.91	13.85	(52.1)
Off-Grid Licensees						
Siem Reap	2,943	3,233	9.9	36.09	19.02	(47.3)
Battambang	3,000	3,125	4.2	40.36	18.22	(54.9)
Banteay Meanchey	2,900	3,257	12.3	30.04	17.66	(41.2)
Pursat	2,800	2,980	6.4	33.11	17.05	(48.5)

^a EAC data; the prices apply to small consumers and are provincial averages.

^b Actual rate charged is \$0.272, or about KR1,132 using the 1 April 2007 exchange rates as shown in the RRP.

() = negative, i.e., decrease; EAC = Electricity Authority of Cambodia; EDC = Electricité du Cambodge; RRP = report and recommendation of the President.

Note: Price decrease is not adjusted for inflation, which averaged 5.5% in Cambodia during 2006–2011; inflating the 2006 rates to 2011 values would further enhance the value of the decreases and lessen the impact of the increases.

18. **Financial performance of Electricité du Cambodge.** A beyond-the-business benefit of the CPTL project is the strengthening of EDC's financial position and technical capabilities (Table 5), in addition to the aforementioned increase in customers and a reduction in tariffs and line losses. While CPTL and the Banteay Meanchey grid are among many projects undertaken by EDC since 2005, EDC's 2010 annual report indicates that energy volumes to the provinces served by the grid have doubled as a percentage of EDC's volumes from 2005 to 2010—from 6% to 12%. Significantly, in 2005 EDC showed zero volume to Banteay Meanchey. From the known tariff information, 2010 sales through the grid were profitable while 2005 sales were either break-even or loss-making, although information is not sufficiently detailed to confirm CPTL's contribution. EDC acknowledged to the evaluation mission CPTL's contribution to EDC's increased capacity.

Table 5: Financial Performance of Electricité du Cambodge
(KR'000)

	2005	2010
Revenues	525,983,158	1,598,138,626
EBITDA	38,849,759	298,516,978
NPAT	(54,821,462)	183,119,455

() = negative; EBITDA = earnings before interest, taxes, depreciation, and amortization; NPAT = net profit after tax.

Sources: Asian Development Bank. 2005. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to (Cambodia) Power Transmission Lines, Co., Ltd. for the Power Transmission Project in Cambodia*. Manila (Table A3.3); Electricité du Cambodge. 2011. *Annual Report 2010*. Phnom Penh.

CHAPTER 2

Evaluation

19. The project is evaluated according to ADB's Guidelines for Preparing Performance Evaluation Reports on Nonsovereign Operations⁷ to give an overall rating of *highly successful* based on four subcriteria: (i) development impacts and outcomes; (ii) ADB investment profitability; (iii) ADB work quality; and (iv) ADB additionality.

A. Project Rationale and Objectives

20. The CPTL project was undertaken in response to a significant shortfall in electricity supply in the northwest region of Cambodia and to provide reliable, lower-cost, cleaner energy to end-users in Siem Reap, Battambang, and Banteay Meanchey provinces. This objective has been achieved. In the period from 2006 (pre-grid) to 2011, EDC's end-users grew by 88%, charges to them fell by 11.8% on average, and line losses declined by 31.3% on average. The licensees that onsell power purchased from EDC in these three provinces had average end-user growth of 517%, reduced charges by an average 55%, and line losses by an average 58.3% to successfully serve nearly 50,000 customers. The addition of Pursat to the Banteay Meanchey grid in 2011, and the resulting 11,000 additional customers, is surplus to the CPTL project's original scope. The grid saves EDC the expense of building its own 80 MW of generation capacity, and displaces previously operated diesel and fuel oil sets throughout these provinces. The connection of 31 licensees to the grid is particularly notable—it appears to be well beyond the initial aspirations for the project and eliminates the need for 31 independently operated, continuously running small generation sets powered by diesel or fuel oil.

21. The project also aimed to finance costs through private capital, and it succeeded. Private equity investors own 100% of the share capital; commercial financial institutions contributed to the debt financing, alongside ADB and Export-Import Bank of Thailand.

22. It is important to recognize that these results are the cumulative effort of the sector planning work undertaken and carried out by relatively young agencies. The CPTL line is a critical piece of infrastructure that contributes to the goal of a national grid and electrification of 70% of the country by 2020. It is operating successfully in a context of significant development work by EDC (construction of the Banteay Meanchey grid, connection of end-users, onselling to other licensees, collection of tariffs) and regulated by EAC; the performance by these agencies is critical to CPTL's ability to increase its results. The performance by EGAT to deliver across national borders has also been integral to the success of the project. At the time of the project's approval in 2006, all these elements had yet to be proven. CPTL's smooth operation through this first-in-kind PPP for Cambodia achieves the development objectives that PSOD directly targeted through this project, as well as those that several other ADB

In the period from 2006 (pre-grid) to 2011, Electricité du Cambodge's end users grew by 88%, charges to them fell by 11.8% on average, and line losses declined by 31.3% on average. CPTL's smooth operation through this first-in-kind PPP for Cambodia achieves the development objectives that ADB targeted through early and sustained focus on the energy sector

⁷ Independent Evaluation Department (IED). 2007. *Guidelines for Preparing Performance Evaluation Reports on Nonsovereign Operations*. Manila: ADB.

departments targeted through early and sustained focus on the energy sector in Cambodia and the GMS.

B. Development Outcomes and Impact

23. Development outcome and impact are evaluated on four subcriteria: (i) private sector development; (ii) business success; (iii) economic development; and (iv) environmental, social, health, and safety (ESHS) performance.

1. Private Sector Development

24. The private sector development rating is *excellent*.

25. The CPTL line has operated continuously since starting operations in December 2007 to supply electricity to the Banteay Meanchey grid that serves Siem Reap, Battambang, and Banteay Meanchey provinces. The grid was extended to Pursat province in November 2011. Demand for electricity has increased each year in all three provinces originally served, and 2011 volumes reached twice the lenders' base-case projections. Individual user connections to the grid have delivered power to 73,503 new customers since 2006, and significantly improved service to the 51,446 existing users; total customers receiving electricity from the grid increased by 143% from the pre-grid customer base over this 5-year period. Small generating sets running on diesel and fuel oil, which once were the primary source of power supply, remain in place only for backup purposes.

26. The volume of power consumed in Siem Reap province is the largest because it supports a vital and growing tourism industry—including the airport, large and small hotel operations, restaurants, electronic booking systems, and popular marketplaces—as well as local homes. CPTL's first full year of operations was 2008, during which it delivered 136.5 GWh to Siem Reap. By 2011, sales to Siem Reap were 212.8 GWh—growth of 55% within 3 years, clearly indicating a rapid expansion of commercial activities.

27. Over the same 3-year period, power consumption rose at even greater rates in Battambang (110%) and Banteay Meanchey (99%), again indicating significant development.

28. The state utility, EDC, has contributed to and benefitted from the experience of the CPTL project and development of the Banteay Meanchey grid. In 2006, EDC operated a small grid system in Phnom Penh, and various independently operated systems were in place to provide 247.75 MW of capacity to the entire country. EDC's own operations were loss-making and its resources and capacity to achieve national electrification goals were limited. Private resources were needed to build the CPTL line. By 2009, EDC was profitable; by 2011, seven grid systems were operating in Cambodia supported by 16 high-voltage lines. Two more high-voltage transmission lines became operational in January 2013 and these, too, are PPP projects.⁸ EDC used the experience gained from developing the CPTL project to further reduce the tariff it will pay for power sourced from these newer lines, and the success of the contractual arrangements that support CPTL's business is likely to have encouraged these new

⁸ The new lines commissioned in 2013 are (i) a 230 kV line owned by Cambodia Power Grid, from Phnom Penh to Battambang, with substations at Phnom Penh, Kampong Chhanang, Pursat, and Battambang; and a (ii) 230 kV line owned by Cambodian Transmission Limited, from Phnom Penh to Kampong Cham, with substations at Phnom Penh and Kampong Cham.

private investors to enter the Cambodian power market. The addition of the new lines contributes to the goal of a national power grid for Cambodia.

29. Nationally, by year-end 2011, EAC had issued 273 licenses to cover 8,705 villages, or 62.46% of the total number of villages. Distribution infrastructure is in place in 6,082 villages, or 43.64% of all villages. Of the licensees, 31 are attached to the Banteay Meanchey grid and they reach nearly 50,000 end-users. The CPTL line is making an important contribution to the national electrification goals of Cambodia. The functioning of these arrangements also reflects the increased capacity of EAC, who issued the first license to EDC in 2002. EAC sets the operating and performance requirements for licensees as well as tariff levels. EAC also tracks the disbursements under the Rural Electrification Program, which began in 2007 and is funded by a grant from the World Bank. Through it, 5,273 connections were added in the provinces served by the Banteay Meanchey grid in 2010.

The CPTL line is making an important contribution to the national electrification goals of Cambodia

30. An explicit goal of the project was to enable EDC to deliver additional power at more competitive rates, and to connect and aggregate demand from disparate load centers.(footnote 3; Project Framework, Outcome) The lower-cost power that EDC is able to source through the CPTL line has resulted in lower tariffs to EDC's customers. Overall, the availability and reliability of lower-cost power has increased the customer base—served both by EDC and by EAC-approved licensees—by 1.5 times since pre-grid 2006. EDC's direct customer tariffs have fallen by 11.8% on average, and those of on-grid licensees in Siem Reap, Battambang, Banteay Meanchey and Pursat by 51.2% on average (The average tariffs have fallen 55% on average if Pursat is excluded from the calculation.). The addition of 31 licensees to the Banteay Meanchey grid was well beyond expectations, which were generally focused on EDC's own operations as they existed at the time of the RRP. Particularly notable is the fact that in 2005 (the results available for the RRP), EDC reported zero power sold to Banteay Meanchey. Some activity began in 2006, but once connected to the grid, Banteay Meanchey consumed 28 MW of power in 2011.

The addition of 31 licenses to the Banteay Meanchey grid was well beyond expectations

2. Business Success

31. The rating for business success is *satisfactory*.

32. The key measure for business success is the project's real financial internal rate of return (FIRR) relative to the weighted average cost of capital (WACC). It is important to note that CPTL is a utility that is not expected to reap excessive profits for its services; all charges paid by EDC to CPTL must be passed on to end-users, and higher profits for CPTL would imply higher tariffs for EDC's customers. The returns to CPTL are appropriate for the risks it is taking in its operations, and the asset has performed exceptionally well over its operating life to date. As long as the asset is properly maintained and EGAT continues to deliver the contracted amount of power, CPTL's results are sustainable.

The returns to CPTL are appropriate for the risks it is taking in its operations, and the asset has performed exceptionally well over its operating life to date

3. Economic Development

33. The rating for economic development is *excellent*.

34. The primary basis for the economic development rating is the recalculated real economic internal rate of return (EIRR). The CPTL project's real EIRR reflects the significant reduction in costs to the end-users for nonincremental power, as well as the lower-cost incremental power supplied by the project.

35. Access to electricity supports economic development. Although provincial gross domestic product figures are not available for Cambodia, the increased demand for power is indicative of economic development. As expected, the largest provincial consumer is Siem Reap, the primary destination for Cambodia's tourism trade. Tourism is one of three key contributors to Cambodia's gross domestic product,⁹ and power is needed to support the attractions of Siem Reap for tourists: the airport, large and small hotels, restaurants, electronic ticketing and billing systems, popular market places. Siem Reap's power consumption has grown from 136 MW in 2008 to 212 MW in 2011. As long as the CPTL line is properly maintained, this level of activity is sustainable.

4. Environmental, Social, Health, and Safety Performance

36. The rating for environmental, social, health and safety (EHS) performance is *satisfactory*.

a. Environmental and Social Performance

37. CPTL has two elements of environmental and social impacts. First is the project's construction and operations; second is the environmental and social benefit of clean, continuous power. The project was classified as category B for environment, category B for involuntary resettlement, and category C for indigenous peoples. CPTL prepared an initial environmental impact assessment (IEIA) that revealed no major environmental issues.¹⁰ Construction was completed in two stages—Battambang to Siem Reap, and Battambang to Banteay Meanchey. Construction of the first stage was under way while the financing was being developed, and during this phase CPTL was working toward compliance with ADB's policy requirements. The IEIA reviewed both the completed and in-progress construction underway for the first stage as well as the planned second stage construction. The lenders' engineer reviewed the IEIA, conducted its own assessment, and undertook an additional review to assess the social protection issues with regard to ADB's policies. The resettlement due diligence report recommended that a short resettlement plan be completed for the second stage, and CPTL did so.¹¹

38. **Construction and operations.** The project was constructed primarily along the government-owned rights of way of national roads NR5 and NR6 using 22-meter-high reinforced concrete poles inserted into precast concrete foundations. The only constructions not on government-owned land are (i) an 18 km detour around the town of Sisophon in Banteay Meanchey province (through rice fields, where steel lattice towers are installed); (ii) a 12 km route from NR5 to the Cambodia–Thailand border crossing point 12 km north of Poipet (through land owned by CPTL's shareholders; concrete poles similar to those described above are used); and (iii) the substations, built on land purchased by CPTL's shareholders.

39. Small land areas had to be purchased for the three substations, resulting in relocation of one home at each substation. These plots were selected through

⁹ The other two are agriculture (32% of national gross domestic product in 2011) and industry (22%). Industry is dominated by construction and also manufacturing, especially of textiles, garments, and footwear. From www.cambodiainvestment.gov.kh. *Linked material "Economic Overview of Cambodia."* Phnom Penh.

¹⁰ CPTL. May 2006. *Cambodia Power Transmission Line Report on Initial Environmental Impacts Assessment*. Cambodia.

¹¹ CPTL. September 2006. *Resettlement Planning Document, Short Resettlement Plan—CAM: CPTL Power Transmission Project*.

expressions of interest and on a willingness-to-sell basis, compensation was paid, and all three homes were relocated within their villages. Five additional empty plots were purchased for access roads to the substations.

40. For the 18 km detour around Sisophon, 66 plots of 100 square meters each were purchased for the steel lattice towers. This affected 55 landowners because some have two towers on their property.¹² Affected persons interviewed in the due diligence process stated that they did not believe that the land acquired would affect their livelihood or source of income, nor would it affect existing land use on their remaining land.

41. All along this detour and the rest of the 221 km route, CPTL worked with local communities to minimize disruption. As a result, only one house and two wooden sheds were relocated to make room for poles. The house was relocated on the same land about 10 meters away from the original position. Compensation was also paid to affected persons using the land within the right of way, even though the government owned it. Payments to these persons were not required by Cambodian law at the time (Land Law, 2001), but to comply with ADB policy, this compensation was agreed. No businesses had to be relocated due to construction, although some minor temporary disruption of 1–2 days was noted for 11 stores along the entire route (footnote 11).

42. The IEIA team interviewed 900 households across the route and found: “Moreover, all communities’ representatives who have been involved in the process have expressed that the construction of this power transmission line is important for the livelihood development by promoting business activities and improving services for tourists. Besides this development they are also aware that the construction activities will create noise, dusts, emission and other unprecedented disturbances to their routine activities; but they said that those disturbances will cause no problems, they are minor and it is temporary in nature. They all were very happy, they said that by the end we can expect cheaper electricity.”

43. The vast majority of compensation was paid for 2,439 trees lost or moved along the route to satisfy safety requirements. Of the 2,515 affected persons, IED estimates that 2,180 were affected by and compensated for tree removals.

44. For the two construction stages, CPTL set aside a total compensation budget of \$1,191,550—\$870,000 for the first stage, covering 1,417 affected persons, and \$321,550 for the second stage, covering 1,098 (plus \$37,155 contingency and \$50,000 monitoring).

45. Although the final closeout report was not submitted to ADB, from the due diligence reports and resettlement audit it is clear that CPTL took the environmental and social issues seriously and that all plans and activities bar these final payments are well documented. CPTL worked closely with ADB and independent experts to determine a successful and generous plan beyond government requirements to ensure that the project would be welcome and the communities would not face disruptions. The reports also confirm that meetings were held with the villages to distribute information about the project, and that affected persons felt they had adequate notice and understanding of the project. The ADB grievance mechanism was explained, and the reports note that the population and the affected persons in the area were generally

CPTL worked with local communities to minimize disruption

All communities’ representatives who have been involved in the process have expressed that the construction of this power transmission line is important for the livelihood development

¹² Using the estimates of 5 persons per household this would attribute 275 affected persons to the land purchased for towers.

familiar with the workings of the international donors' systems of compensation and complaints because of the number of previous developmental projects undertaken in Cambodia. ADB has not received any complaints, and EAC, EDC and the resident mission stated that they are not aware of any ongoing issues with the CPTL project.

46. In interviews conducted by the evaluation mission for this performance evaluation report, CPTL advised that the final closeout report was not submitted because the records of compensation payments had been lost in the management change in 2010 and therefore they could not offer written proof that 100% of the compensation claims had been paid. The evaluation mission did not have the resources to repeat the extensive village interviews completed by the 2008 audit, and it was not clear that repetition of these interviews would be useful given the passage of time. CPTL appears to have done an exemplary job in working with the communities and ADB to ensure that people were well informed, proper compensation was paid in compliance with ADB policies and beyond the requirements of local laws, and minimal disruption was achieved.

47. **Cleaner power.** While many grid customers maintain generator sets as backup systems in case of grid outages, informal interviews with a small sample of business and residential consumers confirmed that the primary source of power is the grid. While outages do occur, they are not viewed as significant disruptions, and grid power is generally restored in a few hours; often the outages are announced in advance over the radio. (Interview notes are in Appendix 3). Data showing that EDC's own, larger-scale backup systems dispatched only 1% of the power consumed in 2011 further confirm this assertion.¹³

b. Health and Safety Performance

48. The key health and safety risks that could arise from the project's ongoing operations are: the potential for soil and water contamination from equipment leakage and hazardous substances; accidental escape of sulfur hexafluoride (SF6), and perceived potential health risks associated with electromagnetic fields. Substations were constructed on elevated pads to avoid damage that could be caused by flooding. Transformers are within securely gated and well-marked compounds. Crushed rocks cover the ground sections under the transformers and wires to limit the potential spread of fire. There is a formal procedure for SF6 handling. A record of complaints is maintained. CPTL has complied with the procedures documented in the operation and maintenance manual.

49. During construction a particular safety risk arose from the need to connect the line from Thailand to Cambodia through an area believed to have been heavily mined during conflicts in the 1970s and 1980s. The project managed the clearing of unexploded ordnance successfully and nobody was injured.

50. Another safety risk is the proximity of the poles to the road. As mentioned, the poles were located in the areas adjacent to the road due to that land's availability and suitability for the construction. However, during the evaluation mission for this report, there was an accident involving a heavy truck carrying a full load of gravel. The truck was traveling at speed and swerved to avoid an oncoming car, hitting one of the CPTL poles and bringing down 10 poles altogether.

¹³ EAC. 2012. *Report on Power Sector of the Kingdom of Cambodia for the Year 2011*. Phnom Penh.

51. The evaluation mission was at the sight of the accident within 24 hours, and it was clear that CPTL and EDC have a well-functioning emergency response system. The line automatically shut off when the impact occurred, CPTL and EDC staff were automatically notified, and by the time the mission arrived at the scene a full crew comprised of CPTL and EDC staff was in place, including managers from both entities. Spares were brought in from the Siem Reap warehouse, damaged poles were removed, and replacement foundations and poles were installed. Power was restored 4 days after the accident and nobody was injured. The project design did not require any form of guardrails along the long stretches of highway and this may be an aspect to consider for future upgrades. However, vehicles hitting guardrails at speed may result in injuries to drivers and the risk to human life may be greater than the risk to the CPTL line; in 5 years of operations this was CPTL's first incident of this kind.

CPTL and EDC have a well-functioning emergency response system

C. ADB Investment Profitability

52. ADB's investment profitability is rated *satisfactory*.

53. ADB led development of the loan transaction and attracted other lenders to the financing. Pricing accurately reflects the relative risks of the Cambodian banking market in 2007. At the time there were no such transactions within Cambodia. This pricing was approved by ADB's then-acting Pricing Committee when the RRP was submitted, and it was sufficient to attract three other senior lenders to the transaction, further confirming its appropriateness for the time and place.

54. CPTL was able to refinance all outstanding senior and subordinated debt and repaid the loans in full on 21 February 2013.

D. ADB Work Quality

55. ADB's work quality is rated *excellent*.

56. The CPTL transaction reflects well on ADB's energy sector focus since 1992. It contributed to the 2001 Electricity Law to codify the requirements of the regulatory agencies and the state utility. ADB technical assistance in 1990s considered the feasibility of the proposed interconnection from Thailand to Battambang, and ADB has made a significant contribution to the GMS energy framework. ADB also extended considerable assistance to the Ministry of Industry, Mines, and Energy; EDC; and EAC for training and capacity building as well as notable support to EAC for tariff reform and guidelines for effective monitoring of licensees.¹⁴ These efforts all contributed to the environment that enabled the CPTL project to be developed with fully documented contractual PPP arrangements. In 2006, these agencies were all still in very early stages of development and CPTL was the first PPP for a transmission line in Cambodia.

The CPTL transaction reflects well on ADB's energy sector focus since 1992

57. Work quality is evaluated on three subcriteria: (i) screening, appraisal, and structuring; (ii) monitoring and supervision; and (iii) ADB role and contribution.

¹⁴ IED. 2009. *Country Assistance Program Evaluation—Cambodia: Growth and Sector Reform*. ADB: Manila; IED. 2009. *Rapid Sector Assessment—Energy Sector in Cambodia*. ADB: Manila; ADB. 1999. *Technical Assistance for the Update of Power Rehabilitation II Project Preparation Study in Cambodia*. Manila; ADB. 2005. *Technical Assistance Completion Report: Capacity Building of Electricity Authority of Cambodia*. Manila. (TA 4169-CAM).

5. Screening, Appraisal, and Structuring

58. The screening, appraisal, and structuring rating is *excellent*.

ADB played a significant role in shaping the transaction in terms of debt structuring and environmental, social, health, and safety requirements

59. ADB played a significant role in shaping the transaction in terms of debt structuring and ESHS requirements. The debt structure is a classic project finance structure designed to protect the interest of the lenders and the business through covenants requiring extensive controls and monitoring throughout the life of the loan, appropriate for a high-risk situation such as this. The project was the first transmission line PPP in Cambodia. The PPP was being implemented by relatively young agencies with limited resources and no track record of fulfilling contractual PPP arrangements for a cross-border transmission line. These elements create both project risk and political risk. Further, the retail electricity network (Banteay Meanchey grid) needed to be developed to connect the line to the end-users, and the electricity itself had to be delivered from Thailand to Cambodia during a time of border tension between the two countries. Conditions for construction of the project itself were somewhat difficult due to some land-mined areas and the general weather and land conditions.

60. Due diligence on the sponsors was carried out using due diligence checklists plus an external expert, and consultation with the Cambodia Resident Mission. ADB led project and social due diligence through the lenders' engineer. Loan documents required submission of budgets and ongoing environmental reporting as well as limited access to the offshore bank accounts, and these documented requirements served the project well. The lenders' base case was suitably conservative for the situation that existed in 2006, resulting in an adequate level of long-term debt financing. As has been noted, the success of the CPTL project required the performance of many parties that did not have a track record for a project like CPTL. However, the unmet need for electricity to support economic development was recognized, and ADB developed a transaction appropriate for the situation at the time. The screening and appraisal work done by ADB to determine the viability of the project and develop an appropriate financing structure met the highest standards.

6. Monitoring and Supervision

61. The rating for monitoring and supervision is *excellent*.

Extensive ongoing monitoring was carried out

62. Extensive ongoing monitoring was carried out through the lenders' engineer, with very thorough reports on technical, environmental, and social matters throughout the life of the loan.

63. When the shareholders' dispute happened, the situation benefitted from both good documents and good judgment, led by PSOD but in close coordination with and supported by the other departments to understand the facts of the situation and to gain required approvals.

7. ADB Role and Contribution

64. The rating for ADB role and contribution is *excellent*.

65. ADB involvement was essential in attracting other financiers to the project given the perceived risks discussed in screening, appraisal, and structuring above. ADB led due diligence and loan structuring, offering the range of possible ADB products and ADB's own long-term debt financing to encourage other lenders to participate in the

transaction. ADB's environmental and social protection policies were followed, beyond the government requirements in place at the time. There were no known highly structured long-term project financings of this nature in Cambodia at the time; ADB brought considerable resources and expertise to the situation to allow CPTL to deliver a high-quality project.

66. ADB's contribution to the energy sector development in Cambodia is also noted and contributes to the excellent rating for the eventual development of the CPTL project.

ADB brought considerable resources and expertise to the situation to allow CPTL to deliver a high-quality project

E. ADB Additionality

67. ADB's additionality is rated *excellent*.

68. The situation in Cambodia in 2006 was very different from today; the ministries, agencies, and the state utility that were in very early stages of development have now gained considerable experience; national power consumption has increased from 1,057 GWh by 358,270 consumers (2006) to 2,572 GWh by 810,984 consumers (2011) (footnote 1 and footnote 13); Gross domestic product has increased from \$7.24 billion (2006) to \$12.83 billion (2011), gross national income per capita (in current US dollars adjusted for purchasing power parity) has increased from \$1,630 (2006) to \$2,180 (2011).¹⁵ In 2006, the perceived political risks and payment risks were great and local experience with private sector infrastructure financing in Cambodia was limited at best. ADB's involvement in the transaction was critical to fulfilling CPTL's requirement of attracting long-term debt financing to the project from financial institutions; these institutions were reluctant to take on long exposures to the project and political risks without ADB's presence in the financing.

69. The leadership displayed by ADB throughout the shareholders' dispute helped CPTL to survive that crisis without enduring a debt restructuring or other problems that calling an event of default could have caused for CPTL. CPTL's successful ongoing operation preserved the important demonstration effect of the transmission line PPP. EDC has successfully developed two more such projects in Cambodia, both commencing operations in 2013.

70. As discussed in Key Project Features and Progress Highlights (section I), the CPTL project delivers a critical piece of infrastructure to Cambodia's ongoing national electrification. Continuous follow-up to ensure compliance with reporting requirements and ESHS plans has contributed to CPTL's ability to safely deliver a product that has benefitted the communities it serves, both through the skilled jobs that CPTL itself created and through the regional economic development that access to electricity made possible.

¹⁵ World Bank DataBank. 2013. *World Development Indicators: Cambodia*. www.databank.worldbank.org

F. Overall Project Rating

71. Table 6 summarizes the criteria ratings for the CPTL project, which result in the overall rating of *highly successful*.

Table 6: Performance of the Investment in (Cambodia) Power Transmission Lines

Criteria and subcriteria	Unsatisfactory	Less than Satisfactory	Satisfactory	Excellent
Development outcomes and impact				X
(i) Private sector development				X
(ii) Business success			X	
(iii) Economic development				X
(iv) ESHS			X	
ADB investment profitability			X	
ADB work quality				X
(i) Screening, appraisal, and structuring				X
(ii) Monitoring and supervision				X
(iii) ADB role and contribution				X
ADB additionality				X
	Unsuccessful	Partly successful	Successful	Highly successful
Overall assessment				X

Issues and Lessons

A. Issues

72. The final closeout report on the social protection compensation payments to landowners has not been submitted, although the lenders' engineer reported that the majority of required payments had been made by 2009. It is noted that four homes but no businesses were relocated as a result of the CPTL project. Compensation was made for the relocated homes and for loss of trees, and for small plots of land required for the installation of poles. The project was implemented in two stages and the lenders' engineer had been able to document all but a small portion of the compensation for the second stage. Based on the short resettlement plan prepared for the second stage of construction, (footnote 11) and the audit advice, IED roughly estimates the undocumented portion of the compensation to be \$67,000, out of the \$1,278,705 budgeted for both stages of the project. CPTL advised the evaluation mission that there are no outstanding claims, and given the passage of time since construction, the risk of any new claims appears remote. The regulator, EAC, also confirmed that there have been no issues with CPTL's compliance with regulations. ADB has no records of complaints or concerns.

ADB's long-term focus on energy sector development has contributed to the improving electrification rates in Cambodia

B. Lessons

73. **Long-term sector engagement facilitated the enabling environment.** ADB's long-term focus on energy sector development has contributed to the improving electrification rates in Cambodia. Since 1992, ADB's country strategy for Cambodia has always prioritized the energy sector (in coordination with other donors, especially the World Bank, and aligned with government interest). These efforts contributed to the 2001 Electricity Law that codified the sector's regulatory agencies. Confidence in the regulator is a key element of private sector participation in the sector. ADB has made a significant contribution to the GMS energy framework, and ADB technical assistance in the 1990s considered the feasibility of the proposed interconnection from Thailand to Battambang. ADB also extended considerable assistance to the Ministry of Industry, Mines, and Energy; EDC; and EAC for training and capacity building as well as notable support to EAC for tariff reform and guidelines for effective monitoring of licensees. Progressive reform and development activity, to which ADB meaningfully contributed in a focused manner over several years, resulted in an environment that made it possible to attract private sector investment.

74. The CPTL project itself offers a meaningful demonstration effect. It was well constructed and delivered electricity on time and to agreed specifications, in turn allowing EDC to deliver electricity to its customers. Under the PPA, EGAT delivers electricity to EDC via CPTL as agreed. EDC meets its contractual payment obligations to EGAT and CPTL. EAC monitors tariffs and licensees, allowing project benefits to be passed on to the end-users in the form of lower tariffs. For PPP investments to succeed, all the stakeholders that affect the perception of the investment environment must commit long-term support to PPPs, agreements must be documented, and all parties must fulfill documented contractual obligations. In the case of the CPTL project, these

elements have all combined to allow CPTL to deliver impressive results, and this achievement is recognized.

75. **Additional resident mission resources could aid in due diligence.** Whether this dispute and its potential to disrupt the business could have been prevented through a change in due diligence procedures requires consideration, although the causes of the dispute itself are not clear. All existing due diligence requirements appear to have been completed, including checklists, and PSOD used an external consultant and included the resident mission in its due diligence process, even without a formal due diligence requirement to do so. The due diligence appears to have used all reasonable avenues (combined with direct experience observing all parties participate in many months of work and negotiation toward a well-documented transaction) and suggests that there was no more information to be gathered at entry. The dispute occurred years after transaction development was completed and it does not seem possible to have foreseen this situation, indicating the limits of what due diligence can achieve. However, reviewing the project did turn up a potential enhancement that could be added to resident mission resources—without a formal requirement to include resident missions in due diligence, it is difficult for them to dedicate staff to the specific function of due diligence and maintain databases about potential project sponsors that might be able to provide additional knowledge and insight to those making investment decisions. If additional resources are allocated to resident missions specifically dedicated to sponsor due diligence, they could further strengthen the process, with a report of their own complementing the reports from external consultants.

Additional resources allocated to resident missions specifically dedicated to sponsor due diligence could further strengthen the process

76. **Controls over project cash flows and bank accounts protect project interests.** The loan structure included strict controls over the project bank accounts. Bank accounts specifically dedicated to the CPTL project needed to be opened and maintained both outside the host country (the offshore account) and within it (the onshore account). All amounts payable to the project are required to be paid into the offshore account and may only be withdrawn according to the payment priorities and amount limits specified in the loan document. The importance of achieving these protections for the project and the lenders' interests is noted as a critical point of transaction development.

77. **Sponsors can identify qualified local maintenance providers.** CPTL's international maintenance provider departed with the majority shareholders and was successfully replaced with a local provider. If the project sponsors or project management teams are able to find suitably qualified local operation and maintenance solutions, costs to the project are likely to be lower and an important opportunity to create skilled jobs is created from the outset. During the evaluation mission it emerged that often where international equipment and financiers are involved in project finance, there is a perception among sponsors that international maintenance providers are required. Through ADB's due diligence with lenders' engineers, ADB may be well placed to take a leadership role in considering local maintenance providers alongside international providers where sponsors put forward these options for lenders' consideration. It is the sponsors who select the parties to implement the project, not ADB, and quality maintenance is a critical element of a successful project. The suggestion then is to check early in the project development process that project sponsors understand that ADB will consider various options to deliver a successful project.

78. **Guardrails might mitigate against transmission line accidents.** The CPTL line runs along regional highways on government-owned rights of way and by necessity the

poles are close to the road. During the evaluation mission there was a vehicle accident that required 10 poles to be replaced. Although nobody was hurt in the accident and the coordinated CPTL–EDC emergency response plan was very effective, Siem Reap was without grid power for 4 days. One possible mitigation of such a risk might be guardrails along the road. The point where the accident occurred is a long, slightly curving stretch of highway in a sparsely populated area, with no guardrails. It is acknowledged that this recommendation is a bit more complex to implement than it might appear—determination of which party approves, pays for, and maintains the guardrails (transport ministry [roads] or energy ministry [power lines], line owner, others), and what specifications are required would be needed. In 5 years of CPTL operations this is CPTL’s first accident of this nature, so it would be important to consider the full cost–benefit implications, but it does appear that a conscious decision on the matter might serve the interests of future projects well.

One possible mitigation of transmission line accidents involving vehicles might be guardrails along the road

79. **Emergency power plans are outdated.** As discussed above, an accident resulted in a 4-day power outage for Siem Reap. In times of grid outages, Siem Reap is served by EDC’s 10.5 MW diesel-powered plant combined with individually owned generator sets that run on diesel and fuel oil. Those who depend on EDC for power suffer rolling brown-outs, but the many people and small businesses that are not connected to the EDC plant and have no individual backup generators face total blackout, i.e., these people have no power at all, and often, no water.

80. For short periods these conditions are tolerable, but for a major outage such as that witnessed during the evaluation mission, these plans are inadequate. Losses to businesses due to outages included cancelled bookings at smaller hotels without backup generators, food spoilage due to no refrigeration, less customer traffic due to discomfort for patrons in the high temperatures, and inability to manage booking changes or take credit card payments due to inoperable electronic ticketing and payment systems. Some of the hotels permanently changed their source of television transmission to a satellite provider not dependent on the grid. For those without water, there is no plumbing, no tap water, and no laundry available. (Notes from interviews with a small sample of local businesses and residents are in Appendix 3.) Although the situation was extraordinary, the economy and expectations of the residents have changed dramatically in the 5 years of grid power availability, and emergency plans need to evolve accordingly. There may be an opportunity for an ADB public sector project to support development of emergency plans and power plants dedicated to emergency power supply.

There may be an opportunity for an ADB public sector project to support development of emergency plans and power plants dedicated to emergency power supply

Appendixes

APPENDIX 1: PRIVATE SECTOR DEVELOPMENT INDICATORS AND RATINGS

Indicators	Ratings ^a				Justifications
	U	LS	S	E	
1. Beyond Company Impact				X	
<u>Private sector expansion:</u> Contribution by a pioneering or high-profile project that facilitates in its own right, or paves the way for, more private participation in the sector and the economy at large				X	CPTL is an important demonstrator of the success of the first-in-kind PPP arrangements and their potential for Cambodia's transmission lines. Two privately owned high-voltage transmission lines began service in January 2013. EDC benefitted directly from the experience of developing the CPTL line to attract new entrants and increase the benefits of subsequent projects. Electricity supply directly impacts economic development.
<u>Competition:</u> Pressure on public and/or other sector players to raise efficiency and improve access and service levels in the industry					Not rated. The CPTL line provides a service in a dedicated concession area. The CPTL line's successful operation allowed EDC to develop its capacity and to deliver other projects.
<u>Innovation:</u> Demonstration of efficient new products and services, including areas such as marketing, distribution, tariffs, production, etc.				X	The CPTL line provides unprecedented access to power for Cambodia's northwest provinces. Stable supply and pricing allows EDC to deliver continuous power at lower tariffs.
<u>Links:</u> Relative to investments the project contributes notable upstream or downstream linkage effects to business clients, consumers, suppliers, key industries, in support of growth				X	ADB's investment was \$7 million; total project cost was \$33.5 million. The impact on the provinces served is dramatic relative to the investment amounts.
<u>Catalytic element:</u> Contribution by pioneering and/or catalytic finance, mobilizing or inducing more local or foreign market investment in the sector				X	Two new privately owned high-voltage transmission lines have begun operations; both are owned by Chinese entities. CPTL successfully refinanced itself in the local market on February 2013.
<u>Affected laws, frameworks, regulation:</u> Contributes to improved laws and sector regulation for PPPs, concessions, JV, and BOT projects and liberalizing markets as applicable for improved sector efficiency				X	The CPTL project is a vital demonstrator to potential new entrants of the ability of the parties (EAC, EGAT) to meet their contractual obligations under the first-in-kind PPP arrangements for Cambodia. The regulator, EAC, has honored the tariff arrangements as contracted, recognizing the demonstration effect of a stable regulatory environment.
2. Company Impact with Wider Potential				X	
<u>Skills contribution:</u> Contribution to new strategic, managerial, and operational skills with actual or potential wider replication				X	The CPTL line has created skilled jobs in the energy sector, developing a potential labor pool for new transmission lines. Replication of the project has occurred with 2 new PPP transmission lines now in operation. EAC has used the experience of the CPTL

Indicators	Ratings ^a				Justifications
	U	LS	S	E	
in the sector and industry					project to increase its capacity to develop a national electricity grid for Cambodia.
<u>Demonstration of new standards</u> : As seen in new ways to operate the business and compete, and in investee performance against relevant best industry benchmarks and standards					Not rated. CPTL operates under a concession agreement in a designated geographic area. The CPTL line is being operated to an appropriate standard with very low line losses. CPTL staff turnover is very low.
<u>Improved governance</u> : As evident in set standards in corporate governance, stakeholder relations, ESHS fields, and/or in good energy conservation standards				X	The CPTL project demonstrates the ability of the parties (EDC, EGAT, CPTL) to meet with contractual obligations under the first-in-kind PPP arrangements for Cambodia. The CPTL project continued to run smoothly throughout border tensions between Thailand and Cambodia, and CPTL's management changes. CPTL's ESHS efforts were exemplary, doing extensive work with communities along the 221-kilometer route to minimize disruption from the line and to pay compensation beyond government requirements.
3. Overall PSD Rating				X	The CPTL project has made an exceptional contribution to Cambodia's northwest provinces, providing critically needed lower-cost, continuous electricity to support economic development and quality of life.

^a U = unsatisfactory; LS = less than satisfactory; S = satisfactory; E = excellent.

ADB = Asian Development Bank; CPTL = (Cambodia) Power Transmission Lines; EAC = Electricity Authority of Cambodia; EDC = Electricité du Cambodge; EGAT = Electricity Generating Authority of Thailand; ESHS = environmental, social, health, and safety; PPP = public-private partnership, PSD = private sector development.

APPENDIX 2: CAMBODIA POWER TRANSMISSION LINES OWNERSHIP

1. On 29 April 2005, the opportunity to build the transmission line was awarded to A.S.K. Co., a Cambodian company in the SKL Group. Both SKL and A.S.K. had extensive business interests within and outside of Cambodia.
2. SKL and A.S.K created the special-purpose company (Cambodia) Power Transmission Lines Co., Ltd. (CPTL). SKL took 40% direct ownership and A.S.K. took 25% to become CPTL's majority shareholders. Two individual investors joined the company as minority shareholders: Se Thma Pich (20% direct ownership) and Tea Tyas (15% direct ownership). A.S.K. novated all project-related documents to CPTL on 28 July 2005.
3. After the shareholders' dispute in August 2010, Ms. Se purchased 100% of the shares held by the majority shareholders. Ms. Se now owns 85% of CPTL, and Mr. Tea 15%.

APPENDIX 3: SUMMARY OF EVALUATION MISSION INTERVIEWS WITH LOCAL USERS

1. The evaluation mission took the opportunity to directly interview a small sample of the Siem Reap population. Interviews of 27 people were done, including large hotel managers, shop staff, restaurant operators, tourists, tuk-tuk drivers, and market workers. Although the sample taken was small due to the limited time and resources available, the responses were very consistent and the mission did not sense that more interviews would have yielded different opinions on the electricity service, although more individual detail might have emerged. The discussions were informal as people were approached where they were and as they were, without appointments.

2. As it happened, the mission's visit coincided with an accident on the highway that disrupted grid power to Siem Reap for 4 days during the peak tourist season and very hot weather. As discussed elsewhere, this outage had tangible consequences for businesses and residences, some of which were observable and some of which were reported through these interviews. However, the outage also highlighted how fully integrated into the daily life of Siem Reap the use of electricity has become since (Cambodia) Power Transmission Lines (CPTL) began operations in December 2007. The absence of grid power seriously disrupted commercial and domestic operations and pointed out the weakness in the backup power supply.

A. Price

3. The most striking observation was how well informed people were about the electricity. All individuals were able to report exactly how much they pay per kilowatt-hour, and they also knew that the supply comes "from Thailand". This suggests both that the electricity is newly introduced and that it is still expensive for people; although prices have fallen, many did expressly comment that they find it expensive.

4. One restaurant employee in a large hotel said that the high cost of power made Cambodia's tourism industry less competitive than Vietnam's because five-star Vietnamese hotels benefitted from cheaper power prices, which can contribute to lower room rates: "Power here is very expensive, 800 [riels]. In Vietnam they pay 200 [riels] and for the same-quality hotel they can charge much cheaper rates. Also, we have to import everything here, meat and produce. Fruit—30% from Thailand [and] 30% from Vietnam. Meat too. Farmers do not have technical skills, and 6 months to feed and raise a pig do not make enough money. [Cambodia has] good air and land and weather, [but needs] skills. People cannot think long-term and in [the] countryside there is very little education."

5. A manager at another five-star hotel reported that the grid had "saved [the hotel] some money, it is cheaper than fuel for generation. Also quieter." This hotel is in the process of doubling its size due to the very strong demand for five-star hotels in Siem Reap. At the moment, demand for five-star accommodation almost exceeds supply; many guests will stay only in five-star hotels and are willing to pay to do so. One hotel advised 100% occupancy rates over the New Year period. In response to the specific query to this expanding hotel, "Would the hotel go through with the expansion without the grid," the answer was, "Yes, probably." Access to reliable, cheaper power was important, but not the only factor in the business decision, as would be expected.

B. Supply

6. All interviewees reported satisfaction with the normal electricity service and they confirmed that they have access to electricity if and when they want it. Although there are outages, they are not

normally a major inconvenience; 1–4 hours once per month or quarter. When the power goes out, they do not worry that it will not return. Often these outages are scheduled and “they announce it by radio.”

7. A few people reported that when they plug in multiple items they lose power. It was unclear if this is due to limited capacity available to their homes or if this is due to faulty wiring, but a few respondents said, “It’s OK, but it’s not enough” in reference to the power supplied.

C. Backup Supply

8. When the grid is out, people rely on either individual backup generators or the backup 10.5-megawatt diesel plant that the utility, Electricité du Cambodge, maintains for Siem Reap. Given current demands for power, the backup power is distributed to the area on rolling blackouts, giving these areas 4 hours of power per day. However, the backup service does not reach all areas in Siem Reap province. Those with their own backup generators also cannot run them continuously; the mission was advised that “the lights go out now because the backup generator needs to rest for 30 minutes every 12 or 24 hours.”

9. All hotel staff interviewed confirmed that the hotels maintain their backup generators and would not risk operating without one. Guest tolerance for power outages is extremely low. One manager of a five-star hotel open since December 2012 reported that they had opened before their backup generator was installed. During the busy Christmas season there were disruptions to the power and as a new hotel they decided to refund a majority of the room rates paid to them during that time. During the February outage, some of the hotels permanently changed the source of television transmission to a satellite service provider not dependent on the grid; although those with backup generators were able to provide reasonably normal guest services and televisions may be powered by power from backup generators, television broadcasts could not be transmitted without power and the guests complained. One hotel stated that they had chosen their location because “This street is on the same line as the Palace, so we more often have power than not.”

10. During the mission, tourists were observed switching from small hotels without backup generators to other hotels with backup generators. One large hotel that did not appear to have a working backup generator was too overwhelmed by activity to speak with us, so it was not possible to learn why they did not maintain the back-up generator.

11. Additionally, small businesses such as shops and restaurants reported a dramatic drop in patronage during the outage. It was simply too hot for people to venture out to non-airconditioned, poorly lit spaces (“hot, dark, nobody come in; lose sale in blackout; electricity helps business to grow”), and restaurants reported they could not offer a full range of items to those who did.

12. Another disruption to service arose from the loss of ticketing and billing systems that run on power. The mission’s consultant advised that the bus system could not confirm or reschedule tickets due to the power situation and that in order to do so they needed to call the Phnom Penh office. Others could not process credit card payments without electricity.

13. A final and significant concern is access to water. A number of people reported that the backup supply does not reach their residence and that, without power, they also lose access to water. This did not seem to be a consistent response, as some people seemed to have continuous water and others did not. One person reported that they still have a well, so they are always with water, and they take care to maintain the well.

14. Some lighter notes were struck as well. One young tour guide reported that he’d been behind on his laundry before the blackout and now the unexpected 4 days without power was causing him

concern with the tour guide company because he was out of clean uniforms. Another person complained, "No TV at night! So boring!"

D. Conclusion

15. It does appear from observations that power supply through the grid is working as advised, and that people are paying rates in line with those reported. Quality of service through the grid is adequate in the usual course of events, and the use of electricity is widespread in the province.

