

## FINANCIAL ANALYSIS

### A. Introduction

1. The financial evaluation of the proposed National Solar Park Project was carried out in accordance with the Guidelines for Financial Management and Analysis of Projects of the Asian Development Bank (ADB).<sup>1</sup> Electricite du Cambodge (EDC) will be responsible for the procurement of land to support a solar park where a 100-megawatt (MW) solar photovoltaic plant will be constructed, development of common infrastructure, and the construction of a transmission line to the national grid. The 100 MW solar photovoltaic plant will be developed in two stages as an independent power project with EDC as the sole offtaker under a long-term power purchase agreement (PPA). Stage one involves the construction of a 60 MW solar photovoltaic plant followed by a 40 MW solar photovoltaic plant in stage two.

### B. Methodology and Major Assumptions

2. The project's overall objective is to demonstrate that large-scale solar is a viable alternative to planned fossil-fuel and hydropower generation. All financial costs and benefits are expressed in second-quarter 2018 constant prices. The solar park infrastructure will be constructed over 22 months during 2019–2021; commercial operations of the 60 MW photovoltaic solar plant are scheduled for 2021, followed by the 40 MW solar photovoltaic plant 12 months later. The expected operational period is 20 years for each plant. The analysis was conducted in real, pre-financing terms and therefore excludes price contingencies and financing costs.

3. Project financial viability was assessed by calculating the financial internal rate of return (FIRR) on the incremental cash flows of the with-project and without-project scenarios. The project's FIRR was compared to the project's weighted average cost of capital (WACC). A project is considered financially viable if the FIRR is equal to or greater than the WACC.

4. The without-project case assumes that future demand for electricity would be served by a mixture of existing power plants, new thermal and renewable power plants, and electricity imports. In the with-project scenario, the same mix of power plants and electricity imports would remain, but the project's output would partially displace existing generation and electricity imports, thus reducing fuel and imported electricity costs. The avoided costs from displaced generation are assumed equal to fuel costs or, for imports, the average import price over the period.

5. Project costs used to estimate the FIRR for the with-project scenario include land acquisition, site preparation, transmission line infrastructure, incremental operational and maintenance costs, taxes and duties, physical contingencies (10%) and power purchase costs from the solar plant. The estimated non-escalating solar plant tariff paid by EDC under the PPA was determined by an independent power project target 12% return on equity (P50 yield) and debt size equal to a debt service cover ratio of 1.25x (P90 yield).<sup>2</sup> This return on equity may appear relatively low for Cambodia, but it reflects that many of the project-specific risks (e.g., land acquisition and power evacuation) will be borne by EDC. The estimated tariff for the 60 MW solar plant was \$0.069/kWh, and for the 40 MW solar plant \$0.073/kWh.<sup>3</sup>

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<sup>1</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

<sup>2</sup> During the first full year of operations, the estimated plant generation yield will exceed the P50 value 50% of the time and will exceed the P90 value 90% of the time.

<sup>3</sup> A conservative approach has been taken to estimate the tariff of a 60 MW plant, wherein no tariff optimization is assumed for a capacity increase from 50 MW to 60 MW, and the tariff is estimated to be similar to a 50 MW plant.

6. Based on yield calculations for the site, EDC's technical advisors estimated the average expected output of the plant at about 225 gigawatt-hours per annum.<sup>4</sup> Panel degradation was modelled at 0.5% (of energy output) per annum. The possibility of replacing the solar panels and other equipment at the end of the operating period was ignored and no residual value was ascribed.

### C. Weighted Average Cost of Capital

7. WACC was calculated for the project in after tax real terms (Table 1). The project will be financed by a loan provided by ADB from ADB's ordinary capital resources and the Scaling-Up Renewable Energy facility (SREP) on concessionary terms. The government is expected to on-lend to EDC on a back-to-back basis, in foreign exchange. Equity will be contributed by EDC and a grant from SREP. The Government of Cambodia (credit rating of B2 by Moody's Investors Services) does not currently issue bonds, but would be expected to issue bonds at nominal yields higher than those of Vietnam (with a credit rating of Ba3 by Moody's Investors Services), as its closest comparator in terms of credit rating within the Association of Southeast Asian Nations. Vietnamese 10–15-year local currency bonds currently yield 4.4%–4.7%.<sup>5</sup> To estimate the cost of equity based on Cambodia's risk profile relative to Vietnam, a higher nominal risk-free rate of 5.0% was assumed, plus a 7.0% premium to cover systematic project risks, resulting in a nominal 12.0% cost of equity, which is similar to the cost of equity assumed on other solar photovoltaic projects in Cambodia during 2016. The opportunity cost of the grant funds from SREP is assumed to be equal to the cost of equity.

**Table 1: Weighted Average Cost of Capital (%)**

	Equity	SREP Grant	SREP Loan	ADB Loan	Total
A. Amount (\$ million)	5.1	3.0	11.0	7.6	26.7
B. Weighting (%)	19.0	11.2	41.2	28.6	100.0
C. Nominal Cost <sup>a</sup> (%)	12.0	12.0	1.2	2.2	
D. Tax Rate <sup>b</sup> (%)	0	0	20	20	
E. Tax Adjusted Nominal Cost [C * (1-D)] (%)	12.0	12.0	0.9	1.7	
F. Inflation Rate <sup>c</sup> (%)	3.2	3.2	1.5	1.5	
G. Real Cost [(1 + E) / (1 + F) - 1] (%)	8.5	8.5	0.0	0.2	
H. Weighted component of WACC (%)	1.6	1.0	0.0	0.1	
<b>Weighted Average Cost of Capital (Real)</b>					<b>2.6%</b>

ADB = Asian Development Bank, EDC = Electricite du Cambodge, SREP = Scaling-Up Renewable Energy Facility

<sup>a</sup> Loans provided on concessionary terms. Includes on-lending margin and guarantee fee of 0.65% for the ADB loan and the SREP loan includes an on-lending margin and guarantee fee of 1.05%.

<sup>b</sup> The current Cambodian corporate tax rate of 20% was applied.

<sup>c</sup> Cost escalation factors are determined by ADB; details available on request

Source: Asian Development Bank estimates.

### D. Financial Internal Rate of Return

8. Incremental cash flows attributable to the project are estimated based on the assumptions outlined above. The FIRR for the project is 8.4% and financial net present value, when discounted at the WACC, is KR72,593 million, demonstrating that the project is financially viable to EDC. The incremental cash flow financial analysis is shown in Table 2.

<sup>4</sup> This is the P50 plant yield value for the first full year of operations (defined in footnote 2, above).

<sup>5</sup> Vietnam Bond Market Association. 2018. [Bond Market Report: June – 2018](#). Ha Noi.

**Table 2: Aggregate Financial Internal Rate of Return Calculation**  
(KR million, constant 2018 prices)

Year	Benefits	Costs				Net Cash Flow
	Avoided Costs	Capital	O&M	Power Purchases	Income Tax	
2019	0	33,883	0	0	0	(33,883)
2020	0	39,222	0	0	0	(39,222)
2021	9,594	29,417	280	8,964	(174)	(28,893)
2022	48,095	-	1,121	41,960	(9)	5,023
2023	77,253	-	1,121	60,244	2,049	13,839
2024	76,178	-	1,121	59,068	2,044	13,946
2025	74,672	-	1,121	57,900	1,959	13,692
2026	73,197	-	1,121	56,756	1,876	13,443
2027	71,750	-	1,121	55,634	1,796	13,199
2028	70,330	-	1,121	54,533	1,719	12,957
2029	68,940	-	1,121	53,455	1,646	12,717
2030	67,577	-	1,121	52,399	1,575	12,482
2031	66,242	-	1,121	51,363	1,506	12,251
2032	64,931	-	1,121	50,347	1,440	12,022
2033	63,647	-	1,121	49,351	1,378	11,796
2034	62,389	-	1,121	48,376	1,317	11,575
2035	61,156	-	1,121	47,420	1,258	11,357
2036	59,946	-	1,121	46,482	1,202	11,142
2037	58,761	-	1,121	45,563	1,148	10,929
2038	57,600	-	1,121	44,662	1,096	10,720
2039	56,461	-	1,121	43,780	1,045	10,516
2040	55,344	-	1,121	42,913	997	10,313
2041	46,210	-	1,121	36,037	807	8,244
2042	16,055	-	841	13,063	243	1,908
Terminal value:						0
<b>FIRR (Post-tax real):</b>						<b>8.4%</b>
<b>FNPV</b>						<b>72,593</b>

( ) = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance

Source: Asian Development Bank estimates.

## E. Sensitivity Analysis

9. A sensitivity analysis was carried out to test the robustness of the FIRR and financial net present value to adverse changes in the assumed values of key variables as follows: (i) a 10% increase in capital costs; (ii) a 10% increase in the solar photovoltaic plant PPA tariff; (iii) a 10% reduction in the generation output of the solar photovoltaic plant at P50 generation levels; (iv) a 10% increase in operation and maintenance costs; and (v) a 1-year delay in implementation of the solar photovoltaic plant, but with on-time completion of the solar park.

10. Table 3 shows the results of the sensitivity analysis. The project's FIRR is robust and exceeds the WACC of 2.6% for all sensitivity scenarios tested. The project's financial viability is most sensitive to an increase in the solar photovoltaic plant PPA tariff.

**Table 3: Sensitivity Analysis**

Sensitivity Parameter	Variation	FIRR (%)	FNPV (KR million)	SV(FIRR)
Base case		8.4	72,593	
1 Project capital costs	+ 10%	7.2	62,037	69
2 Increase in solar tariff	+10%	3.4	8,976	11
3 Generation output decrease (P50 level) <sup>a</sup>	- 10%	6.3	43,616	(37)
4 Operation and maintenance costs	+ 10%	8.2	70,650	528
5 Delay in solar photovoltaic plant operations <sup>b</sup>	1 year	7.3	65,613	14

( ) = negative, FIRR = financial internal rate of return, FNPV = financial internal rate of return, O&M = operation and maintenance, SV = switching value

<sup>a</sup> During the first full year of operations, the estimated plant generation yield will exceed the P50 value 50% of the time.

<sup>b</sup> This scenario considers a 1-year delay in the start date of operations for stages one and two, but with the solar park completed on time by EDC.

Source: Asian Development Bank estimates.

## F. Financial Performance and Projections of Electricite du Cambodge

11. EDC has been consistently profitable throughout 2013–2017, with a return on equity equal to or greater than 15% in all years. EDC's net cash flows between 2013–2017 were all positive except for 2016. This was primarily due to a large increase in inventories in that year.

12. EDC's financial position is exposed to changes in power purchase costs and to the extent that these can be passed into retail electricity tariffs. Loans to EDC are denominated in dollars or euros, which exposes EDC to risks associated with foreign exchange movements.

13. **Compliance with financial covenants.** EDC's performance against the financial covenants included in the most recent project agreement with ADB—for the Cambodia Rural Energy Project—is shown in Table 4.<sup>6</sup> EDC has fully complied with these covenants in all years. The decline in the debt service coverage ratio in 2016 is attributable to lower cash flows from operations in that year, due to the accumulation of inventories as noted above. The debt-service coverage ratio then returns to 3.58x in 2017 which is 2.28x above the covenant level.

**Table 4: Historical Compliance with Financial Covenants (Cambodia Rural Energy Project)<sup>a</sup>**

Ratio Details	Covenant	Actuals				
		2013	2014	2015	2016	2017
Self-financing Ratio <sup>b</sup>	25% Min	201%	174%	160%	92%	150%
Debt-Service Coverage Ratio	1.3x Min	4.33x	3.49x	4.30x	2.75x	3.58x
Debt Share	70% Max	45%	46%	46%	47%	49%
Accounts Receivable	3.0 Max	2.53	2.03	1.73	1.74	1.73

<sup>a</sup> Asian Development Bank. Cambodia. [Rural Energy Project](#).

<sup>b</sup> Funds from internal sources

Source: Asian Development Bank estimates.

14. **Financial projections.** The projections show declining profitability to 2022, with EDC's return on equity falling from an estimated 16% in 2018 to 9% by 2022 (Table 5). This results from the combination of declining tariffs, growing power purchase costs and the large-scale investment program, which leads to rapidly increasing depreciation charges. The investment program and

<sup>6</sup> ADB. Cambodia. [Rural Energy Project](#).

accompanying borrowing requirements see rising debt levels, with the share of debt in the capital structure rising from less than 50% to close to 60%.

15. **Projected compliance with financial covenants.** EDC continues to comply with its covenants in almost all years of the projection period, although the self-financing ratio falls to 21% in 2020 before recovering in 2021. This decline is attributed to large capital expenditures during 2018–2020, in conjunction with tariffs reductions following current plans. A subsequent decline in capital expenditure requirements results in the self-financing ratio returning above the covenant level.

**Table 5: Summary projected financial statements and covenant compliance**

		Projections				
		2018	2019	2020	2021	2022
<b>STATEMENT OF INCOME</b>						
Operating Revenue		4,762,348	5,611,700	6,155,601	6,757,331	7,417,808
Operating Expenditures		(3,966,357)	(4,551,810)	(5,392,904)	(5,895,773)	(6,681,469)
<b>Operating Profit</b>		795,991	1,059,890	762,697	861,558	736,339
Net Financing Costs		(96,623)	(120,720)	(139,712)	(158,917)	(160,191)
<b>Profit after Tax</b>		559,494	751,336	498,388	562,113	460,918
<b>STATEMENT OF FINANCIAL POSITION</b>						
<b>Assets</b>		9,204,065	11,203,815	12,500,951	13,376,095	13,851,155
<b>Liabilities</b>						
Long-term Borrowings		4,467,772	5,678,622	6,432,422	6,799,738	6,744,447
Other Liabilities		1,314,358	1,520,076	1,750,032	1,899,296	2,192,671
Equity		3,421,935	4,005,117	4,318,497	4,677,061	4,914,037
<b>FINANCIAL RATIOS</b>		<b>Covenant</b>				
Self-Financing ratio	25%	33%	48%	21%	62%	68%
DSCR	1.30	3.43	3.97	2.42	3.34	3.42
Debt Share	70%	57%	59%	60%	59%	58%
Accounts Receivables	3.00	1.70	1.67	2.33	2.29	2.29
Operating Margin		20%	23%	14%	15%	11%
Return of Fixed Assets		8%	9%	5%	5%	4%
Return on Equity		16%	19%	12%	12%	9%
Current Ratio		2.02	2.27	2.05	2.18	1.95

( ) = negative, DSCR = debt-service coverage ratio

Source: Electricite du Cambodge audited financial statements, Asian Development Bank estimates.