



# Report and Recommendation of the President to the Board of Directors

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Project Number: 51182-001  
April 2019

## Proposed Loan and Administration of Loan, Grant, and Technical Assistance Grant Kingdom of Cambodia: National Solar Park Project

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Asian Development Bank

## **CURRENCY EQUIVALENTS**

(as of 29 March 2019)

Currency unit	–	riel (KR)
KR1.00	=	\$0.00025
\$1.00	=	KR4,017

## **ABBREVIATIONS**

ADB	–	Asian Development Bank
EDC	–	Electricite du Cambodge
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
GS6	–	grid substation 6
ha	–	hectare
IEE	–	initial environmental examination
kWh	–	kilowatt-hour
LARP	–	land acquisition and resettlement plan
MW	–	megawatt
OPPP	–	Office of Public-Private Partnership
PAM	–	project administration manual
PIC	–	project implementation consultant
ROW	–	right-of-way
SCF	–	Strategic Climate Fund
TA	–	technical assistance
TAS	–	transaction advisory services

## **NOTE**

In this report, “\$” refers to United States dollars unless otherwise stated.

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## PROJECT AT A GLANCE

<b>1. Basic Data</b>		<b>Project Number:</b> 51182-001	
<b>Project Name</b>	National Solar Park Project	<b>Department /Division</b>	SERD/SEEN
<b>Country Borrower</b>	Cambodia Kingdom of Cambodia	<b>Executing Agency</b>	Electricite Du Cambodge
<b>2. Sector</b>	<b>Subsector(s)</b>	<b>ADB Financing (\$ million)</b>	
✓ <b>Energy</b>	Electricity transmission and distribution		7.64
		<b>Total</b>	<b>7.64</b>
<b>3. Strategic Agenda</b>	<b>Subcomponents</b>	<b>Climate Change Information</b>	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Climate Change impact on the Project	High
Environmentally sustainable growth (ESG)	Eco-efficiency	<b>ADB Financing</b>	
	Global and regional transboundary environmental concerns	Adaptation (\$ million)	1.17
	Natural resources conservation	Mitigation (\$ million)	6.47
<b>4. Drivers of Change</b>	<b>Components</b>	<b>Gender Equity and Mainstreaming</b>	
Governance and capacity development (GCD)	Anticorruption	Some gender elements (SGE) ✓	
	Client relations, network, and partnership development to partnership driver of change		
	Institutional systems and political economy		
Knowledge solutions (KNS)	Pilot-testing innovation and learning		
Partnerships (PAR)	Bilateral institutions (not client government)		
	Commercial cofinancing		
	International finance institutions (IFI)		
	Private Sector		
Private sector development (PSD)	Conducive policy and institutional environment		
	Promotion of private sector investment		
	Public sector goods and services essential for private sector development		
<b>5. Poverty and SDG Targeting</b>		<b>Location Impact</b>	
Geographic Targeting	No	Nation-wide High	
Household Targeting	No		
General Intervention on Poverty	No		
SDG Targeting	Yes		
SDG Goals	SDG7, SDG13		
<b>6. Risk Categorization:</b>	Low		
<b>7. Safeguard Categorization</b>	<b>Environment: B Involuntary Resettlement: B Indigenous Peoples: C</b>		
<b>8. Financing</b>			
<b>Modality and Sources</b>		<b>Amount (\$ million)</b>	
<b>ADB</b>		<b>7.64</b>	
Sovereign Project (Concessional Loan): Ordinary capital resources		7.64	
<b>Cofinancing</b>		<b>14.00</b>	
Strategic Climate Fund - SREP - Project grant (Full ADB Administration)		3.00	
Strategic Climate Fund - SREP - Project loan (Full ADB Administration)		11.00	
<b>Counterpart</b>		<b>5.07</b>	
Government		2.94	
Others		2.13	
<b>Total</b>		<b>26.71</b>	
Note: An attached technical assistance will be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund in the amount of \$500,000.			





## I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to the Kingdom of Cambodia for the National Solar Park Project. The report also describes (i) the proposed administration of a loan and a grant to be provided by the Strategic Climate Fund (SCF),<sup>1</sup> and (ii) the proposed administration of technical assistance (TA) to be provided by the Republic of Korea e-Asia and Knowledge Partnership Fund for Capacity Development in the Electric Utility Industry. If the Board approves the proposed loan, I, acting under the authority delegated to me by the Board, approve the administration of the SCF loan, the SCF grant, and the TA.

2. The project will support the expanded deployment of solar photovoltaic power plants in Cambodia and address the country's need to (i) expand low-cost power generation; (ii) diversify the power generation mix with an increase in the percentage of clean energy, in line with its greenhouse gas emission reduction targets<sup>2</sup>; and (iii) expand the use of competitive tenders and other global best practices in the energy sector. The project will support the national electricity utility, Electricite du Cambodge (EDC), in constructing a 100-megawatt (MW) capacity solar power park (comprising civil works, including access roads, fencing, and drainage systems) and a transmission interconnection system to the nearest grid substation.<sup>3</sup> Through a transaction advisory services (TAS) agreement between the Office of Public–Private Partnership (OPPP) of the Asian Development Bank (ADB) and EDC, the project also aims to help EDC design and conduct a competitive tender for procuring an independent power producer to build the first solar power plant within the park.<sup>4</sup>

## II. THE PROJECT

### A. Rationale

3. Since 2010, the Government of Cambodia has made significant progress in developing the country's power network. The expansion of distribution networks to increase electrification rates and expansion and diversification of national generation capacity beyond diesel plants have helped the government lower power prices and meet high annual growth in demand that averaged 16% during 2011–2017. These efforts have contributed to high economic growth and substantial poverty reduction, but Cambodia's gross domestic product per capita, estimated at \$1,427 in 2017, remains among the lowest in Southeast Asia, and nearly 5 million Cambodians lack access to electricity. Continued investment to expand the supply of electricity from sustainable and affordable sources will improve Cambodia's economic competitiveness and the welfare of its people.

4. **Energy sector status.** At the end of 2017, Cambodia's installed capacity totalled 1,878 MW: hydropower accounted for 980 MW (52%), coal-fired generation for 564 MW (30%), diesel for 295 MW (16%), biomass for 29 MW (less than 2%), and solar for 10 MW (less than 1%) (footnote 2). The hydropower and coal-fired plants are owned by the private sector and operated under long-term power purchase agreements, which were contracted through unsolicited bids with take-or-pay arrangements. In addition to domestic generation, about 18% of the electricity supply is imported from Thailand and Viet Nam. In 2017, 82% of villages and 69% of households had access to electricity.

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<sup>1</sup> The SCF grant is funded through the Scaling Up Renewable Energy Program in Low-Income Countries.

<sup>2</sup> Electricity Authority of Cambodia. 2018. *Report on the Power Sector of the Kingdom of Cambodia, 2018 Edition*. Phnom Penh.

<sup>3</sup> The project is included in Asian Development Bank (ADB). 2017. *Country Operations Business Plan: Cambodia, 2018–2020*. Manila.

<sup>4</sup> The solar power plants will be tendered to independent power producers in two phases. The first phase is 60 MW. The second phase will procure 40 MW, for a total of 100 MW.

5. The Power Development Plan<sup>5</sup> (revised in 2015) projects annual electricity demand of 18,000 gigawatt-hours in 2030; demand was 8,073 gigawatt-hours in 2017. The government forecasts meeting demand growth through further investment in thermal generation (coal-fired in the short term, and coal- or gas-fired in the long term) and large hydropower. Power imports, which contributed significantly to meeting domestic demand since 2007, are being substantially reduced and replaced with domestic generation. Recent policies, however, have started a shift from coal and hydropower development to more sustainable alternative energy sources, particularly solar. The government's Rectangular Strategy, Phase IV (2018–2023), highlights increased investment in solar energy to reduce electricity costs and ensure long-term energy security.<sup>6</sup> The government prioritized the development of renewable energy in its National Strategic Development Plan 2014–2018 to meet growing demand for electricity in Phnom Penh and address the country's electrification target of 100% of villages by 2020.<sup>7</sup> The government's Industrial Development Policy, 2015–2025 identifies Cambodia's historically high power tariffs as a major impediment to the competitiveness of manufacturing, and calls for the development of more affordable alternative energy sources.<sup>8</sup> In its Nationally Determined Contribution to the 2015 Paris Agreement, Cambodia committed to reducing energy sector greenhouse gas emissions by 16% from a business-as-usual scenario, by 2030.<sup>9</sup> Clean alternative sources, such as solar energy, would help reduce the cost of electricity supply; complement installed hydropower-based generation, which is often inadequate during the dry season; and provide ancillary benefits to the grid around the key demand centers.<sup>10</sup>

6. To alleviate the impact of high residential power tariffs, in 2015, the government introduced a tariff subsidy scheme for poor and vulnerable households. Customers that consume less than 10 kilowatt-hours (kWh) per month are currently being charged about \$0.12/kWh and those that consume less than 50 kWh are being charged about \$0.15/kWh. The current retail tariff for customers consuming more than 50 kWh in and around Phnom Penh is \$0.18–\$0.19/kWh.<sup>11</sup> Lowering the cost of power has become a major government priority since the subsidy program began. At the same time, the price of imported coal has increased, making coal generation less advantageous, while global prices for renewable technologies, such as solar photovoltaic, are rapidly decreasing. In addition, the development of coal and large hydropower plants is increasingly facing opposition from local communities and civil society. In 2016, the government announced a moratorium on the construction of large hydropower dams until 2020.

7. In 2013, the government, with support from development partners, began to seriously consider solar energy generation. A technical study prepared that year by the Korea Photovoltaic Industry Association for the Ministry of Trade, Industry, and Energy of the Republic of Korea and ADB helped investigate the scope for developing a 100 MW solar power plant in Cambodia.<sup>12</sup> In 2015, a United States Agency for International Development-funded study explored the viability of

<sup>5</sup> Chugoku Electric Power Co., Inc. 2015. *The Project on Revision of Cambodia Power Development Master Plan*. Presentation prepared for the Government of Cambodia. Phnom Penh. September. Unpublished.

<sup>6</sup> Government of Cambodia. 2018. *Rectangular Strategy for Growth, Employment, Equity and Efficiency: Building the Foundation Toward Realizing the Cambodia Vision 2050, Phase IV of the Royal Government of Cambodia of the Sixth Legislature of the National Assembly*. Phnom Penh.

<sup>7</sup> Government of Cambodia, Ministry of Planning. 2014. *National Strategic Development Plan, 2014–2018*. Phnom Penh.

<sup>8</sup> Government of Cambodia. 2015. *Cambodia Industrial Development Policy, 2015–2025: Market Orientation and Enabling Environment for Industrial Development*. Phnom Penh.

<sup>9</sup> Government of Cambodia. 2015. *Cambodia's Intended Nationally Determined Contribution*. Phnom Penh.

<sup>10</sup> Technical or ancillary benefits include (i) voltage support during peak loading periods, (ii) reduction of loading levels on transformers, and (iii) reduction of the amount of power that needs to be generated from distant sources (hydro and coal, in particular) and therefore reduction of losses in the transmission system.

<sup>11</sup> In 2011, typical household prices were \$0.30–\$0.80/kWh and typical countryside prices were \$0.65–\$0.90/kWh.

<sup>12</sup> Korea Photovoltaic Industry Association; KC Cottrell Co., Ltd.; and Sun Business Development (for ADB and the Government of the Republic of Korea, Ministry of Trade, Industry, and Energy). 2013. *Pre-feasibility Study in the Kingdom of Cambodia: Identification of Feasible Sites and Conditions for the Development of 100 MW Photovoltaic Power Project*. Unpublished.

using solar energy to enhance Cambodia's energy security.<sup>13</sup> In 2017, at the government's request, ADB developed a preliminary national solar photovoltaic grid integration study and road map for EDC.<sup>14</sup> The study considered low, medium, and high solar penetration scenarios, and found that using available technology, 150 MW of solar energy generation can be added to the grid by 2020 (100 MW in Phnom Penh and 50 MW throughout Cambodia) without a major impact on the grid or the need for technical upgrades to the existing transmission system. Other related development partner activities include expansion of the national grid (including grid strengthening for expanded renewable energy generation), rural electrification, and capacity building.<sup>15</sup>

8. **ADB experience and strategic alignment.** The government and ADB are developing new strategic priorities for the country's energy sector. ADB's country partnership strategy, 2014–2018 for Cambodia,<sup>16</sup> which was aligned with the Rectangular Strategy, Phase III (2013–2018)<sup>17</sup> and the National Strategic Development Plan, 2014–2018 (footnote 7), focused on two strategic pillars: (i) rural–urban–regional linkages and (ii) human and social development. In line with these priorities, past investments focused on expanding access to the grid by developing transmission and sub-transmission lines and increasing household connections.<sup>18</sup> The Rectangular Strategy, Phase IV (2018–2023) (footnote 6) promotes increased investment in renewable energy, particularly solar, to reduce electricity costs and improve environmental sustainability. ADB's Strategy 2030 similarly promotes addressing poverty in developing member countries, tackling climate change, and enhancing environmental sustainability.<sup>19</sup> In line with these new strategies, ADB is supporting large-scale solar power generation in the country to improve the environmental sustainability of the energy sector, reduce electricity costs, and increase access to electricity, which can help drive economic development.<sup>20</sup> In February 2016, the government's tender for a 10 MW solar plant at Bavet in Svay Rieng Province resulted in a competitive tariff of \$0.091/kWh, below EDC's average cost of supply (\$0.095/kWh in 2015). This project, which is financed by ADB's Private Sector Operations Department, was commissioned in October 2017.<sup>21</sup> Following the solar photovoltaic grid integration study, ADB completed a country-wide solar generation master plan for EDC (para. 7). An upcoming TA subproject will help the government develop a comprehensive energy sector strategy and power development plan.<sup>22</sup>

9. **Value added by ADB assistance.** ADB's experience with the Bavet project, a small project with demonstrational effect (footnote 21), highlighted the importance of long-term international debt financing and standard power purchase agreements, as prerequisites for low-cost solar projects. Building on this experience, the proposed project aims to demonstrate the ability of large-scale solar parks to further lower solar energy prices, while providing technical benefits to the national grid (footnote 10) and complementing hydropower generation. The project will be the first large-scale solar park in Southeast Asia and will draw on ADB's experience with the solar park model in India,

<sup>13</sup> R. de Ferranti et al. 2016. *Switching On: Cambodia's Energy Security in a Dynamic Technology Cost Environment*. Phnom Penh: Mekong Strategic Partners.

<sup>14</sup> This national solar photovoltaic grid integration study was prepared by ADB on a confidential basis for EDC.

<sup>15</sup> Development Coordination (accessible from the list of linked documents in Appendix 2).

<sup>16</sup> ADB. 2014. *Country Partnership Strategy: Cambodia, 2014–2018*. Manila.

<sup>17</sup> Government of Cambodia. 2013. *Rectangular Strategy Growth, Employment, Equity and Efficiency, Phase III of the Royal Government of Cambodia of the Fifth Legislature of the National Assembly*. Phnom Penh.

<sup>18</sup> ADB. [Cambodia: Medium-Voltage Sub-Transmission Expansion Sector Project](#); and ADB. [Cambodia: Rural Energy Project](#).

<sup>19</sup> ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.

<sup>20</sup> Project's Alignment with Strategy 2030 (accessible from the list of linked documents in Appendix 2).

<sup>21</sup> ADB. [Cambodia: Cambodia Solar Power Project](#).

<sup>22</sup> TA subproject under ADB. [Regional: Southeast Asia Energy Sector Development, Investment Planning and Capacity Building Facility](#).

specifically in Charanka, Gujarat State; and in Bhadla, Rajasthan State.<sup>23</sup> The project will help EDC gain knowledge of the capital and operational costs, supply chain requirements, and performance of large solar photovoltaic plants. Further, it will help EDC gain experience in procuring power from the private sector through transparent and competitive procurement, using standardized legal and commercial agreements.

10. The project represents a “One ADB” approach to providing end-to-end support to EDC. Sovereign financing will be provided to help reduce private investment risk in solar generation projects in Cambodia by building the solar park<sup>24</sup> and transmission infrastructure. Ongoing TAS provided by OPSP is helping EDC design and conduct a competitive tender for procuring the first, 60 MW, power plant to be built by the private sector within the park.<sup>25</sup> The TAS includes project due diligence, including legal, technical, financial, environmental, and social aspects; pre-feasibility and feasibility studies;<sup>26</sup> and support for the development of tender documents and long-term power purchase agreements, the tender review, and the selection process. Finally, ADB, through its Private Sector Operations Department, is exploring the potential of financing the development of the first solar plant in the park (footnote 25). Overall project scheduling is being managed, so that the solar park will be completed seven months in advance of the commissioning of the 60 MW solar power plant.

## B. Impact and Outcome

11. The project is aligned with the following impact: cost of electricity in Cambodia lowered (footnote 8). The project will have the following outcome: increase in private sector investments in solar photovoltaic plants facilitated.<sup>27</sup>

## C. Outputs

12. **Output 1: Solar park and transmission interconnection constructed.** The project will support EDC in constructing a 100 MW solar power park in Kampong Chhnang Province and a transmission interconnection system to grid substation 6 (GS6) near the Phnom Penh demand center to supply power to the national grid. The park will consist of 100 hectares (ha) of land, and associated construction works (i.e., fencing, roads, and drainage systems), to accommodate 60 MW of solar photovoltaic plant capacity. The transmission interconnection infrastructure comprises (i) the 100 MW capacity pooling substation at the solar park, with two 50-megavolt-ampere transformers (and room for two additional transformers); switchgear; an ancillary system; and controls; (ii) a supervisory control and data acquisition system compatible with EDC’s requirements, advanced forecasting tools, and expanded information and communication technology applications; (iii) a dedicated 40-kilometer 230-kilovolt double circuit overhead transmission line between the solar park substation and GS6; and (iv) two new bays with switchgear at GS6.<sup>28</sup>

<sup>23</sup> ADB. [India: Clean Energy Finance Investment Program – Tranche 1](#) (70 MW Solar Photovoltaic Power Projects at Bhadla Solar Park); and ADB. [India: Gujarat Solar Power Transmission Project](#).

<sup>24</sup> This includes access roads, drainage, fencing and other common facilities.

<sup>25</sup> The tender will be for a 60 MW solar photovoltaic generating plant, including crystalline silicon solar arrays and mounting structures, power conversion units (inverters and associated transformers), direct current and alternating current plant cabling, power controls, and a supervisory control and data acquisition system. The development of the plant will be financed by the private sector through private sector equity and commercial debt.

<sup>26</sup> The pre-feasibility study was prepared in August 2017 (ADB. [Regional: Demonstration of An Assisted Broker Model for Transfer of Low Carbon Technologies to Asia and the Pacific](#)), and the feasibility study was prepared in August 2018 (ADB. [Regional: Supporting Regional Project Development for Association of Southeast Asian Nations Connectivity](#)).

<sup>27</sup> The design and monitoring framework is in Appendix 1.

<sup>28</sup> EDC is considering a 10 MW (2-hour) battery storage system for output smoothing to counterbalance intermittent solar power generation. ADB will support EDC to apply for grants to support this component, which would then be processed as additional financing. The transmission line will be rated at 230 kilovolts but will be initially operated at 115 kilovolts.

13. **Output 2: Capacity of Electricite du Cambodge in solar power plant construction and operation, project design and supervision, grid integration, and competitive procurement strengthened.**<sup>29</sup> The project will strengthen EDC's capacity to design, construct, and operate solar photovoltaic plants and solar parks (including management of environmental and social safeguards issues). The project will also strengthen EDC's capacity to procure solar photovoltaic generation capacity through the private sector, and to adopt energy storage systems and other measures to integrate intermittent renewable energy into the national grid.

#### D. Summary Cost Estimates and Financing Plan

14. The project is estimated to cost \$26.71 million (Table 1).<sup>30</sup> Detailed cost estimates by expenditure category and by financier are included in the project administration manual (PAM).<sup>31</sup> ADB will finance the common infrastructure for the solar park, including the civil works, pooling substation, GS6 upgrades, transmission line, project implementation consultant (PIC), environmental and social impact mitigation, financial charges during implementation, and physical and price contingencies.

**Table 1: Summary Cost Estimates**  
(\$ million)

Item	Amount <sup>a</sup>
<b>A. Base Cost<sup>b</sup></b>	
1. Output 1: Solar park and transmission interconnection constructed	22.04
2. Output 2: Capacity of EDC in solar power plant construction and operation, project design and supervision, grid integration, and competitive procurement strengthened	1.50
<b>Subtotal (A)</b>	<b>23.54</b>
<b>B. Contingencies<sup>c</sup></b>	<b>2.83</b>
<b>C. Financing Charges During Implementation<sup>d</sup></b>	<b>0.34</b>
<b>Total (A+B+C)</b>	<b>26.71</b>

EDC = Electricite du Cambodge

<sup>a</sup> Includes taxes and duties of \$2.94 million to be financed by the government through exemptions.

<sup>b</sup> In mid-2018 prices as of November 2018.

<sup>c</sup> Physical contingencies computed at 10% of base costs. Price contingencies reflect inflation expectations and include provision for potential exchange rate fluctuations under the assumption of a purchasing power parity exchange rate.

<sup>d</sup> Includes interest charges. Interest during construction for the ADB concessional loan has been computed at 1.00% plus an effective contractual spread of 0.65%. Interest during construction for the Strategic Climate Fund concessional loan has been computed at 0.10% plus an effective contractual spread of 1.05%.

Source: ADB estimates.

15. The government has requested a concessional loan of \$7.64 million from ADB's ordinary capital resources to help finance the project. The loan will have a 32-year term, including a grace period of 8 years; an interest rate of 1.0% per year during the grace period and 1.5% per year thereafter; and such other terms and conditions set forth in the draft loan and project agreements. The SCF will provide loan cofinancing of \$11.00 million and grant cofinancing of \$3.00 million, to be administered by ADB. The SCF loan will have a 40-year term, including a 10-year grace period; and a service charge of 0.1% per year on the disbursed and outstanding loan amount. The interest during construction of the ADB loan and the service charge of the SCF loan will be capitalized. The ADB and SCF loans will be relented by the Ministry of Economy and Finance to EDC under a subsidiary agreement on terms and conditions satisfactory to ADB. In addition to the interest rate and service charge, the subsidiary loans will include an on-lending margin of 0.65% for the ADB loan and 1.05% for the SCF loan. The government will provide counterpart financing of \$2.94 million to finance taxes

<sup>29</sup> Activities will include other energy-sector stakeholders in Cambodia, such as the Electricity Authority of Cambodia.

<sup>30</sup> Costs do not include any battery storage component (footnote 28).

<sup>31</sup> Project Administration Manual (accessible from the list of linked documents in Appendix 2).

and duties through exemptions, and EDC will provide financing of \$2.13 million for land acquisition and resettlement costs. The summary financing plan is in Table 2.

**Table 2: Summary Financing Plan**

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (concessional loan)	7.64	29
Strategic Climate Fund <sup>a</sup>		
Concessional loan	11.00	41
Grant	3.00	11
Government <sup>b</sup>	2.94	11
Electricite du Cambodge <sup>c</sup>	2.13	8
<b>Total</b>	<b>26.71</b>	<b>100</b>

<sup>a</sup> Under the Scaling Up Renewable Energy Program in Low-Income Countries, administered by the Asian Development Bank.

<sup>b</sup> Includes taxes and duties through exemptions.

<sup>c</sup> Includes land acquisition and resettlement-related expenses.

Source: Asian Development Bank estimates.

16. **Climate finance.** Climate mitigation is estimated to cost \$25.54 million, and ADB will finance 25.34% of mitigation costs. Climate adaptation measures have been integrated in the main civil work contract costs, and related costs are about \$1.17 million. ADB will finance 100% of adaptation costs. Details are in the PAM.

## E. Implementation Arrangements

17. EDC will be the executing and implementing agency. A project management office established in EDC will have overall coordination and implementation responsibility, with support from (i) a PIC for supervision of project implementation and management; and (ii) an engineering, procurement, and construction contractor for the solar park civil works, substation, and transmission line. Procurement of the PIC and the contractor will be initiated as advanced action to achieve high project readiness. Because they have undertaken several ADB-financed projects, EDC and the project management office have experience in and detailed understanding of ADB's procurement and financial management policies and procedures. The implementation arrangements are summarized in Table 3 and described in detail in the PAM.

**Table 3: Implementation Arrangements**

Aspects		Arrangements	
Implementation period	July 2019–December 2021		
Estimated completion date	31 December 2021		
Estimated loan closing date	30 June 2022		
Management			
(i) Oversight body	Ministry of Economy and Finance		
(ii) Executing agency	EDC		
(iii) Key implementing agencies	EDC		
(iv) Implementation unit	Established in EDC, Phnom Penh		
Procurement <sup>a</sup>	Open competitive bidding	1 contract	\$16.98 million
Consulting services	Quality and cost-based selection (80:20)	90 person-months	\$1.50 million
Advance contracting	Advance contracting to recruit the project implementation consultant and procure the engineering, procurement, and construction package for the solar park and transmission interconnection was done in Q1 2019.		
Disbursement	The loan and grant proceeds (including ADB-administered cofinancing) will be disbursed following ADB's <i>Loan Disbursement Handbook</i> (2017, as amended from time to time) and detailed arrangements agreed between the government and ADB.		

Asian Development Bank; EDC = Electricite du Cambodge; Q = quarter.

<sup>a</sup> Since the project will be financed with ADB-administered cofinancing resources in the form of a loan and grant from the Strategic Climate Fund, universal procurement will apply to all procurement packages under the project following ADB. 2013. *Blanket Waiver of Member Country Procurement Eligibility Restrictions in Cases of Cofinancing for Operations Financed from Asian Development Fund Resources*. Manila.  
Source: ADB estimates.

### III. ATTACHED TECHNICAL ASSISTANCE

18. The attached TA will support the capacity development of EDC and the Electricity Authority of Cambodia, the national electricity regulator, in solar photovoltaic technology and solar park planning.<sup>32</sup> In conjunction with inputs from the PIC and ongoing OPSP activities, the TA will focus on competitive procurement of power from the private sector and management of power purchase agreements, and technical considerations related to grid integration of intermittent renewable energy. The TA is estimated to cost \$550,000, of which \$500,000 will be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund and administered by ADB. The government will provide counterpart support in the form of counterpart staff, office and workshop space, office supplies, secretarial assistance, local communication facilities, domestic transportation, and other in-kind contributions.

### IV. DUE DILIGENCE

#### A. Technical

19. The project was assessed as technically viable with low technical risks. The transmission interconnection line and pooling substation for the solar park will use standard technologies, and EDC has experience developing and maintaining similar systems. The system design has been analysed, considering the assessed solar irradiation, load demand curve, grid conditions, and weather conditions. The substation will include remote monitoring and protection systems to stabilize the grid in line with international design standards. Training will be provided by the PIC to EDC to support the sustainable operation and maintenance of the solar park and transmission interconnection. EDC will also benefit from the TA subproject by further strengthening its skills in power development planning and grid integration of renewable energy (footnote 22). The climate risk assessment does not anticipate significant climate risks over the design life of the park (25 years); however, site level, drainage provisions, and access road design will take account of potential flood risks.<sup>33</sup>

#### B. Economic and Financial

20. Economic due diligence assessed the project as a whole, including all components (i.e., land acquisition, construction of the solar park, and construction and operation of the 100 MW of solar photovoltaic plants within the park). The project is economically viable with an economic internal rate of return of 20.0%, which exceeds the economic hurdle rate of 9.0%. Economic benefits are all derived from the incremental output of the solar photovoltaic plants to meet additional demand; the basis for the valuation of these benefits was the consumers' willingness to pay. A sensitivity analysis demonstrates that the expected economic performance is robust.

21. The project is financially viable with a financial internal rate of return (FIRR) of 8.4%, which is higher than the 2.6% (real) weighted average cost of capital. A sensitivity analysis was conducted to account for potential variations in financial viability. The project is financially robust, as the FIRR

<sup>32</sup> Attached Technical Assistance Report: Capacity Development in the Electric Utility Industry (accessible from the list of linked documents in Appendix 2).

<sup>33</sup> Climate Change Assessment (accessible from the list of linked documents in Appendix 2).



exceeded the weighted average cost of capital for all the sensitivity scenarios tested as follows: (i) a 10% increase in capital costs, (ii) a 10% reduction in generation output of solar photovoltaic plant at P50 generation levels,<sup>34</sup> (iii) a 10% increase in operation and maintenance costs, and (iv) a 1-year implementation delay of the solar photovoltaic plant.

### C. Governance

22. An assessment of EDC's procurement capacity found a variety of risks, variously assessed as low to high in terms of potential severity, but with ADB support such risks are unlikely to affect the procurement process. The financial management assessment followed ADB guidelines for the Financial Management and Analysis of Projects and the Financial Due Diligence: A Methodology Note.<sup>35</sup> It identified no significant concerns regarding the capability of EDC to manage the project loans and grant in compliance with ADB requirements. The financial management assessment and action plan, as presented in the PAM, have identified required improvements, such as the need to complete the automation of accounting and financial information systems and to extend the scope of the internal auditing department to include externally financed projects. Therefore, EDC's overall pre-mitigation financial management risk is *moderate*. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government and EDC. The specific policy requirements and supplementary measures are described in the PAM. Integrity due diligence on EDC followed ADB *Operations Manual* sections on anticorruption and on enhancing ADB's role in combating money laundering and the financing of terrorism.<sup>36</sup> No potential significant integrity issues were identified with or relevant to the proposed project to be implemented by EDC.

### D. Poverty, Social, and Gender

23. The project is expected to contribute to poverty reduction by improving essential infrastructure and providing clean and reliable energy. It will supply energy to economic and industrial zones in the neighboring provinces that employ or directly support more than 3,000 workers and support other direct and indirect local business opportunities. Clean energy will also avoid emissions from thermal power plants and the associated health impacts, which can disproportionately affect the poor and vulnerable. The project is classified *general intervention* and *some gender elements* at entry. While it does not address poverty directly, the project is expected to indirectly improve well-being and expand opportunities for livelihoods of the poor. The project design includes measures to address poverty, including engaging low-income households and poor women for construction work. The project will comply with applicable national labor laws and core labor standards, including ensuring equal pay for equal work regardless of gender, race, or ethnicity; and prohibiting child labor. It will also include the provision of special assistance to households headed by women with dependents for any loss of livelihood or income, ensure that women represent at least 40% of participants during public consultations about the project, and ensure the EDC capacity building gender target is met.

### E. Safeguards

24. In compliance with ADB's Safeguard Policy Statement (2009), the project's safeguard categories are as follows.<sup>37</sup>

<sup>34</sup> Financial Analysis (accessible from the list of linked documents in Appendix 2).

<sup>35</sup> Financial Management Assessment (accessible from the list of linked documents in Appendix 2); ADB. 2005. *Financial Management and Analysis of Projects*. Manila; and ADB. 2009. *Financial Due Diligence: A Methodology Note*. Manila.

<sup>36</sup> Integrity Due Diligence Disclosure (accessible from the list of linked documents in Appendix 2); ADB. 2010. Anticorruption. *Operations Manual*. OM C5. Manila; and ADB. 2017. Enhancing the Asian Development Bank's Role in Combating Money Laundering and the Financing of Terrorism. *Operations Manual*. OM C6. Manila.

<sup>37</sup> ADB. [Safeguard Categories](#).



25. **Environment (category B).** EDC has prepared an initial environmental examination (IEE) and an environmental management plan (EMP), covering environmental impacts and risks in the project area of influence, including the solar photovoltaic plants, which are associated facilities; and GS6, which is an existing facility.<sup>38</sup> The draft IEE has been disclosed on the ADB website, and the final IEE will be disclosed following the detailed engineering design. EDC will prepare a project brief in the local language, which will be made available at field offices. Public consultations have been initiated to inform the project design and environmental assessment process and will continue during project implementation. The PIC will provide support to EDC for EMP implementation and monitoring. Environmental complaints or grievances will be handled through a grievance redress mechanism. The solar park site and transmission line right-of-way (ROW) consist of shrubland, rice paddies, orchards, and plantations, with the ROW crossing a few small water bodies. No protected areas, significant migratory bird species and flyways, or other particularly sensitive environmental receptors have been identified in the project area of influence. The identified impacts are site-specific and can be reduced to an acceptable level through mitigation measures. Adverse environmental impacts will primarily occur during construction, such as vegetation clearance, some earthworks and site levelling, dust, noise, vibration, disposal of construction spoils, occupational and community health and safety hazards, increased traffic, and disruption due to power outages (e.g., when constructing towers and stringing conductors). The EMP (i) includes mitigation measures during construction and operation, including developing construction management plans; and (ii) identifies responsible parties and an implementation and monitoring budget. These measures and plans will be included in project bid documents.<sup>39</sup> A climate change assessment was conducted and considered in the project design, siting, and construction (footnote 33).

26. **Involuntary resettlement (category B).** Based on preliminary assessments and consultations, the project is not expected to have significant land acquisition impacts. Physical relocation of persons or loss of income are not expected. The project is expected to require about 220 ha of land, of which 100 ha is required for the solar park, including land for the first 60 MW plant. EDC is procuring land for the solar park through negotiated settlement. A land acquisition and resettlement framework has been prepared to guide EDC in case negotiation fails and involuntary land acquisition is required. The transmission tower footings along a 40-kilometer-long ROW are expected to require 3 ha of land, and the 30-meter-wide ROW would require an additional 117 ha. The land for the ROW will not be acquired. EDC has prepared a draft land acquisition and resettlement plan (LARP) for the transmission line component to mitigate impacts, including compensation at full replacement cost and allowances for the tower footings and the ROW. The land acquisition and resettlement framework and the draft LARP have been formulated following government laws and regulations and ADB's Safeguard Policy Statement, and have been disclosed on ADB's website. The project is not expected to acquire any land from customary landowners. No long-term impacts are expected as the construction and operation will not restrict the community from accessing and using nearby resources. EDC's Social, Environment and Public Relation Office has sufficient staff and capacity to plan and implement the LARP. In total, 226 persons (151 men and 75 women) participated in the public consultation meetings. Additionally, 86 women and 66 men participated in sex-disaggregated focus group discussions arranged at villages. EDC will continue consultations with affected communities throughout the project cycle and use its grievance redress mechanism to receive, record, and facilitate the resolution of any concerns. The draft LARP for the transmission line component will be updated and finalized following the detailed engineering design, submitted to ADB for review, and implemented before civil works begin.

<sup>38</sup> Initial Environmental Examination (accessible from the list of linked documents in Appendix 2).

<sup>39</sup> Relevant environmental and social safeguards provisions will also be included in the bid documents, including the power purchase agreement for the associated facilities (i.e., solar photovoltaic plants).

27. **Indigenous peoples (category C).** Based on a social impact assessment, the project is classified *category C* for indigenous peoples and ethnic minorities because no indigenous or ethnic minority people have been found to be affected by the project. In the project area, less than 0.5% of the total inhabitants belong to an ethnic minority (Cham), and they have been integrated into mainstream society.

## F. Summary of Risk Assessment and Risk Management Plan

28. The overall project's risk is *low*. Significant risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.<sup>40</sup>

**Table 4: Summary of Risks and Mitigating Measures**

Risks	Mitigation Measures
EDC has no experience with competitive IPP bidding.	ADB's OPPP is providing transaction advisory services to EDC. Further, project scheduling will be managed, so that the solar park will be completed seven months in advance of the commissioning of the solar power plant.
Government approval or land acquisition process is delayed.	The feasibility study conducted prescreening and suitability analysis. EDC has procured 92 ha of the required 100 ha and will procure the remaining land prior to loan disbursement.

ADB = Asian Development Bank; EDC = Electricite du Cambodge; ha = hectare; IPP = independent power producer; OPPP = Office of Public-Private Partnership.

Source: ADB estimates.

## V. ASSURANCES AND CONDITIONS

29. The government and EDC have assured ADB that implementation of the project shall conform to all applicable ADB policies, including those concerning anticorruption measures, safeguards, gender, procurement, consulting services, and disbursement as described in the PAM and loan and grant documents. The government and EDC have agreed with ADB on certain covenants for the project, which are set forth in the draft loan and grant agreements and project agreement, including a loan disbursement condition requiring all land acquisition and resettlement activities to be completed for the initial 60 MW of solar power plant capacity.

## VI. RECOMMENDATION

30. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Asian Development Bank (ADB) and recommend that the Board approve the loan of \$7,640,000 to the Kingdom of Cambodia for the National Solar Park Project, from ADB's ordinary capital resources, in concessional terms, with an interest charge at the rate of 1.0% per year during the grace period and 1.5% per year thereafter; for a term of 32 years, including a grace period of 8 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan agreement presented to the Board.

Takehiko Nakao  
President

24 April 2019

<sup>40</sup> Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

## DESIGN AND MONITORING FRAMEWORK

<b>Impact the Project is aligned with</b> Cost of electricity in Cambodia lowered (Cambodia Industrial Development Policy, 2015–2025: Market Orientation and Enabling Environment for Industrial Development) <sup>a</sup>			
<b>Results Chain</b>	<b>Performance Indicators with Targets and Baselines</b>	<b>Data Sources and Reporting Mechanisms</b>	<b>Risks</b>
<b>Outcome</b> Increase in private sector investments in solar photovoltaic plants facilitated	By 2022: a. Investment for a 60 MW solar plant reached financial close (2019 baseline: not achieved)  b. Investment for an additional 40 MW of solar plant capacity tendered (2019 baseline: not tendered)	a–b. EDC annual reports	Policy support for solar power is not sustained.
<b>Outputs</b> 1. Solar park and transmission interconnection constructed           2. Capacity of Electricite du Cambodge in solar power plant construction and operation, project design and supervision, grid integration, and competitive procurement strengthened <sup>b</sup>	By Q1 2021: 1a. Solar park infrastructure (including access roads, fencing, and drainage) operational (2019 baseline: not operational)  1b. Pooling substation operational (2019 baseline: not operational)  1c. SCADA system established (2019 baseline: not established)  1d. 2 new bays at GS6 constructed (2019 baseline: 0)  1e. 40 km double-circuit overhead transmission line constructed (2019 baseline: 0)  By Q4 2021: 2. At least 15 EDC staff trained in increased deployment and use of solar power generation, of whom at least 8 are female (2019 baseline: 0)	1a–e. EDC annual reports           2. EDC annual reports	Government approval or land acquisition process is delayed.
<b>Key Activities with Milestones</b> <b>1. Solar park and transmission interconnection constructed</b> 1.1 Completed land acquisition process by Q1 2019 1.2 Release bidding documents for solar park and transmission EPC by Q2 2019 1.3 Award solar park and transmission EPC contract by Q3 2019 1.4 Commission solar park by Q1 2021  <b>2. Capacity of Electricite du Cambodge in solar power plant construction and operation, project design and supervision, grid integration, and competitive procurement strengthened</b> 2.1 Issued request for expression of interest for PIC in Q1 2019 2.2 Award contract by Q3 2019 2.3 Complete consulting services by Q4 2021			
<b>Project Management Activities</b> Advance action: Started recruitment of the PIC and release of bidding documents for the EPC contract in Q1 2019			

<b>Inputs</b> Asian Development Bank: \$7,640,000 (loan) Republic of Korea e-Asia and Knowledge Partnership Fund: \$500,000 (TA grant) Strategic Climate Fund: \$11,000,000 (loan) and \$3,000,000 (grant) Government: \$5,070,000
<b>Assumptions for Partner Financing</b> Private sector sources of finance for first solar plant of 60 MW: \$70,000,000

EDC = Electricite du Cambodge; EPC = engineering, procurement, and construction; GS6 = grid substation 6; km = kilometer; MW = megawatt; PIC = project implementation consultant; Q = quarter; SCADA = supervisory control and data acquisition; TA = technical assistance.

<sup>a</sup> Government of Cambodia. 2015. *Cambodia Industrial Development Policy, 2015–2025: Market Orientation and Enabling Environment for Industrial Development*. Phnom Penh.

<sup>b</sup> Financed through a combination of (i) the procurement of the PIC, and (ii) the attached TA grant: Attached Technical Assistance Report: Capacity Development in the Electric Utility Industry (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President).

Source: Asian Development Bank.

**LIST OF LINKED DOCUMENTS**

<http://www.adb.org/Documents/RRPs/?id=51182-001-3>

1. Loan Agreement: ADB
2. Loan Agreement: Strategic Climate Fund
3. Grant Agreement: Strategic Climate Fund
4. Project Agreement
5. Sector Assessment (Summary): Energy
6. Project Administration Manual
7. Contribution to the ADB Results Framework
8. Development Coordination
9. Financial Analysis
10. Economic Analysis
11. Country Economic Indicators
12. Summary Poverty Reduction and Social Strategy
13. Risk Assessment and Risk Management Plan
14. Attached Technical Assistance Report: Capacity Development in the Electric Utility Industry
15. Climate Change Assessment
16. Initial Environmental Examination
17. Resettlement Plan: Land Acquisition and Resettlement Plan
18. Resettlement Framework: Land Acquisition and Resettlement Framework

**Supplementary Documents**

19. Financial Management Assessment
20. Integrity Due Diligence Disclosure
21. Project's Alignment with Strategy 2030