Report and Recommendation of the President to the Board of Directors

Project Number: 50373-002
September 2017

Proposed Loan and Administration of Technical Assistance Grant
Democratic Socialist Republic of Sri Lanka: Rooftop Solar Power Generation Project

This is the version of the document approved by ADB's Board of Directors that excludes information that is subject to exceptions to disclosure set forth in ADB's Public Communications Policy 2011.

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 21 August 2017)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	$0.00652
$1.00	=	SLRs153.3

ABBREVIATIONS

ADB	–	Asian Development Bank
CEB	–	Ceylon Electricity Board
kWh	–	kilowatt-hour
LECO	–	Lanka Electricity Company Limited
MOFMM	–	Ministry of Finance and Mass Media
MW	–	megawatt
PAM	–	project administration manual
PFI	–	participating financial institution
TA	–	technical assistance

NOTE

In this report, "$" refers to United States dollars.

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CONTENTS

PROJECT AT A GLANCE

1. Basic Data — **Project Number:** 50373-002

Project Name	Rooftop Solar Power Generation Project	**Department /Division**	SARD/SAEN
Country	Sri Lanka	**Executing Agency**	Ministry of Finance
Borrower	Government		

2. Sector	**Subsector(s)**	**ADB Financing ($ million)**
✓ **Energy**	Renewable energy generation - solar	50.00
	Total	**50.00**

3. Strategic Agenda	**Subcomponents**	**Climate Change Information**	
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded	Mitigation ($ million)	50.00
Environmentally sustainable growth (ESG)	Eco-efficiency	CO_2 reduction (tons per annum)	55,600
	Global and regional transboundary environmental concerns	Climate Change impact on the Project	Low

4. Drivers of Change	**Components**	**Gender Equity and Mainstreaming**	
Governance and capacity development (GCD)	Institutional development	Some gender elements (SGE)	✓
Knowledge solutions (KNS)	Pilot-testing innovation and learning		
Partnerships (PAR)	Bilateral institutions (not client government) Official cofinancing		
Private sector development (PSD)	Conducive policy and institutional environment Promotion of private sector investment		

5. Poverty and SDG Targeting		**Location Impact**	
Geographic Targeting	No	Nation-wide	High
Household Targeting	No		
SDG Targeting	Yes		
SDG Goals	SDG7		

6. Risk Categorization: Low

7. Safeguard Categorization **Environment:** FI-C **Involuntary Resettlement:** FI-C **Indigenous Peoples:** FI-C

8. Financing

Modality and Sources	**Amount ($ million)**
ADB	**50.00**
Sovereign Project (Regular Loan): Ordinary capital resources	50.00
Cofinancing	**0.00**
None	0.00
Counterpart	**9.80**
Others	9.80
Total	**59.80**

Note: An attached technical assistance will be financed on a grant basis by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility in the amount of $1,000,000.

Source: Asian Development Bank

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to the Democratic Socialist Republic of Sri Lanka for the Rooftop Solar Power Generation Project. The report also describes the proposed administration of technical assistance (TA) to be provided by the Asian Clean Energy Fund[1] under the Clean Energy Financing Partnership Facility for Implementation Support to the Rooftop Solar Power Generation Project, and if the Board approves the proposed loan, I, acting under the authority delegated to me by the Board, approve the administration of the TA.

2. The project includes (i) debt funding for rooftop solar power generation systems; (ii) development of rooftop solar market infrastructure and a bankable subproject pipeline; and (iii) building capacity and increasing awareness of stakeholders in Sri Lanka.[2]

II. THE PROJECT

A. Rationale

3. **Development priority in renewable energy.** Sri Lanka's energy sector has achieved steady progress in 1990–2016. The national electrification rate has increased from 29.0% in 1990 to 99.3% in 2016.[3] However, thermal power generation accounts for 67.2% compared with 24.6% of hydro power and about 8.2% of nonconventional renewable energy generation in the total generation mix.[4] This creates a high expenditure on fuel imports, undermining the balance of payments position, and affects the environment and Sri Lanka's commitments to the global climate agenda. A key government development priority is to diversify the existing energy generation mix to include more indigenous, renewable energy resources.[5] Sri Lanka's nationally determined contributions target reducing greenhouse gas emissions against the business-as-usual scenario (base year 2013) by 20% (4% unconditional and 16% conditional) in the energy sector through renewable energy development and energy efficiency improvement.[6]

4. **Rooftop solar photovoltaic market.** Sri Lanka has substantial solar energy potential. Situated close to the equator, it has abundant sunlight year round. For over two-thirds of the land mass, solar radiation is in the range of 4.0–4.5 kilowatt-hours (kWh) per square meter per day, which is considered high.[7] However, the development of a solar power generation market has been limited in the past. Buruthakanda Solar Park is the only utility-scale solar park, and has a generation capacity of about 1.2 megawatts (MW) that is operational. The other existing solar power generation facilities are rooftop based. As of November 2016, there were 4,200 customers with net-metered renewable energy facilities, adding up to a cumulative generating capacity of about 30 MW.[8] Almost all of these facilities are solar photovoltaic installations on rooftops, except

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[1] Established by the Government of Japan.
[2] This lending proposal is included in the 2017 program of ADB. 2017. *Country Operations Business Plan: Sri Lanka, 2018–2020.* Manila.
[3] Ceylon Electricity Board. 2017. *Statistical Digest 2016.* Colombo.
[4] Nonconventional renewable energy includes mini hydro up to 10 megawatt (MW) capacity, wind, solar, biomass, tide, and geothermal power generation sources.
[5] Government of Sri Lanka. 2015. *Sri Lanka Energy Sector Development Plan for a Knowledge Based Economy 2015–2025*. Colombo.
[6] Government of Sri Lanka, Ministry of Mahaweli Development and Environment. 2016. *Nationally Determined Contributions*. Colombo.
[7] Sri Lanka Sustainable Energy Authority. Solar Potential. http://www.energy.gov.lk/renewables/renewable-energy-resources/solar/solar-potential.
[8] The current estimate of the rooftop solar photovoltaic cumulative generating capacity is about 80 MW.

for a few small hydro electric facilities.[9] About 95% of net-metered customers are households, while the others are institutional customers. In September 2016, the government announced the Battle for Solar Energy program.[10] The government's strategic goal is to increase solar photovoltaic capacity to 200 MW by 2020 and 1,000 MW by 2025. The program envisages boosting clean power generation through net metering, net accounting, and micro solar power producer (net plus) schemes to connect rooftop photovoltaic installations to the network. These different models are described as follows:

(i) **Net metering.** Introduced in 2008, this model allows customers to offset the consumed electricity with the electricity they generate from their rooftop solar photovoltaic systems that is advantageous for residential customers with high consumption. At the end of monthly billing cycles, if the customers consume more than they have generated from their rooftop solar systems, they are billed at the electricity tariff rates based on their net consumption level. If the customers generate more electricity than they consume, the electricity surplus balance is carried over to the next month. The surplus balances can be kept for up to 10 years and distribution utilities will not pay customers for any generated surplus electricity;

(ii) **Net accounting.** Introduced in 2016, this model allows customers to be paid in cash for any surplus they generate at the end of their monthly billing cycles at the following rates: (a) year 1 to year 7 at SLRs22.0/kWh, and (b) year 8 to year 20 at SLRs15.5/kWh. The advantage to a customer depends on its consumption level;

(iii) **Net plus.** Unlike the other two models, this allows customers to separate electricity consumption and electricity generation. The customers pay for the electricity they consume based on the existing tariff structure. At the same time, the customers can also sell whatever electricity they generate from their rooftop solar photovoltaic systems at the following rates: (a) year 1 to year 7 at SLRs22.0/kWh, and (b) year 8 to year 20 at SLRs15.5/kWh. This scheme may be advantageous for commercial customers with big roof spaces. The scheme was introduced in 2016.

5. **Demand analysis**. The project is built upon a strong government commitment to create a conducive business environment to enable rooftop solar system financing, including development of dedicated financing schemes, introduction of bankable business models, and duty and tax exemptions on solar panels and invertors. Under the net metering scheme, the rooftop solar power generation capacity increased from 0.7 MW to 60.0 MW from 2012 to 2016. With the introduction of the net accounting and net plus models in 2016, the rooftop solar market is poised for further expansion. Based on the financial viability of the three rooftop solar financing models, the market has a strong potential to absorb Asian Development Bank (ADB) funds over the 4–year implementation period.[11] A preliminary indicative subproject pipeline from the PFIs points to a demand for approximately $20 million. A list of the subprojects is provided in a detailed demand analysis, which also ascertains the sufficient market size under the available financing models based on current tariff structure at various lending rates.[12] Market infrastructure is sound. From the suppliers' side, there are about 200 private sector renewable energy service companies with a track record to provide rooftop solar systems installation and maintenance.

6. **Banking sector**. In 2013–2017, the banking sector maintained sound capital adequacy,

[9] No net metered wind or other forms of renewable-energy-based power generating facilities have been reported.
[10] Government of Sri Lanka, Ministry of Power and Renewable Energy. 2016. *Battle for Solar Energy begins from President's house*. http://powermin.gov.lk/english/?p=4454.
[11] Financial Analysis (accessible from the list of linked documents in Appendix 2).
[12] Demand Analysis for Rooftop Solar Systems (accessible from the list of linked documents in Appendix 2).

earning, and asset quality. However, market liquidity is tightening and interest rates are high. Average weighted deposit rates rose from 5.9% in January 2015 to 9.2% in July 2017.[13] Combined with perceived higher commercial risk in the nascent rooftop solar industry with untested business models (e.g., net accounting and net plus), bank lending is limited. Thus, it is essential for the banks to provide the funds at viable terms and conditions to facilitate development while not distorting the market. A detailed analysis of the banking sector is in the financial analysis (footnote 11). ADB identified 10 potential participating financial institutions (PFIs) based on upfront financial soundness criteria, relevant institutional experience, and/or potential subproject pipeline.

7. **Project.** The project will provide long-term debt financing for the installation of rooftop solar photovoltaic power generation systems. The loan will be provided through the Ministry of Finance and Mass Media (MOFMM) to PFIs, including public and private sector banks, for financing qualified rooftop solar systems based on the available business models. TA associated with the project (see para. 23) will support (i) establishing technical guidelines and standards for rooftop solar systems; (ii) subproject screening, implementation, monitoring, and compliance activities; and (iii) stakeholder capacity and market development.

8. The project is consistent with ADB's country partnership strategy for Sri Lanka that prioritizes assistance to renewable energy development.[14] It builds on previous ADB interventions focused on supporting transmission and distribution investments to expand access to clean and reliable electricity.[15] The project considers lessons relating to grid integration of renewable energy and from a similar rooftop solar financial intermediation loan, reflecting improved implementation arrangements and project design.[16] Being a financial intermediation loan, the project will not crowd out similar private sector commercial finance because substantial government support and subsidy (e.g., feed-in tariff and system of import duty exemption) are still required to quickly expand the rooftop solar system finance and installations.[17]

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[13] Central Bank of Sri Lanka. *Current Economic Indicators*. http://www.cbsl.gov.lk/htm/english/_cei/ir/i_4.asp (accessed 21 August 2017).

[14] ADB. 2017. *Country Partnership Strategy: Sri Lanka, 2018–2022—Transition to Upper Middle-Income Country Status.* Manila.

[15] (i) ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loans, Technical Assistance Grant, and Administration of Grant to the Democratic Socialist Republic of Sri Lanka for the Clean Energy and Network Efficiency Improvement Project.* Manila. This funds transmission and medium-voltage infrastructure, including for the evacuation of power from a proposed wind park, and to pilot solar rooftop power generation subprojects.
(ii) Tranche 1 of ADB. 2014. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility to the Democratic Socialist Republic of Sri Lanka for the Green Power Development and Energy Efficiency Improvement Investment Program.* Manila. This finances hydro power development, transmission, and medium-voltage network improvements, and energy efficiency through innovative demand-side management pilot subprojects.
(iii) ADB. 2011. *Technical Assistance to the Democratic Socialist Republic of Sri Lanka for Preparing the Clean Energy and Network Efficiency Improvement Project.* Manila (TA 7837-SRI). Under this project preparatory TA, ADB supported actual wind and solar measurements, and wind and solar resource assessments at potential project sites.
(iv) A system stability study and a country renewable energy master plan, along with a master plan and a business model of proposed wind parks, were prepared with the support of ADB. 2012. *Technical Assistance to the Democratic Socialist Republic of Sri Lanka for Capacity Building for Clean Power Development.* Manila (TA 8167-SRI).

[16] ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility and Administration of Technical Assistance Grant to Punjab National Bank for Solar Rooftop Investment Program*. Manila.

[17] Factual evidences from a number of countries have demonstrated that the cost of rooftop solar energy is not commercially viable during the initial rollout stage without significant public sector support. Germany, India, Japan, and People's Republic of China used significant government subsidies to develop rooftop solar generation. The

9. **Value added by ADB assistance.** The project will enable ADB to help the government establish a lending facility to support rooftop solar financing. ADB has extensive technical and financial expertise in renewable energy development in South Asia, including from a $500 million project in India to support a similar rooftop solar financing in 2016 (footnote 16). ADB's knowledge and experience will bring international best practices to the PFIs and help Sri Lanka develop innovative renewable energy solutions. This will contribute to the government's program of increasing clean power generation from solar energy, particularly the rooftop solar targets of 200 MW by 2020 and 1,000 MW by 2025. The project will help mainstream renewable energy development, increase the generation capacity for clean power, and improve the environmental conditions in the country. [18] It will increase the clean power generation capacity by 50 MW, which will result in about 72,300 megawatt-hours of energy generation per year, equivalent to avoiding about 55,600 tons of carbon dioxide emissions per year.

B. Impact and Outcome

10. The project is aligned with the following impact: access to clean and reliable power supply in Sri Lanka increased by 2025 (footnote 5). The project will have the following outcome: clean power generation enhanced.[19]

C. Outputs

11. **Output 1: Debt funding for rooftop solar power generation increased.** This includes financing of rooftop solar subprojects equivalent to additional capacity of 50 MW.

12. **Output 2: Rooftop solar market infrastructure and bankable subproject pipeline developed.** This includes (i) selection of PFIs for handling debt funding of commercial and domestic sector rooftop solar systems; (ii) development of a pipeline of bankable subprojects for total capacity of 50 MW; and (iii) establishment of project technical guidelines and standards to be followed by borrowers, vendors, and accredited engineers.

13. **Output 3: Capacity and awareness of stakeholders, including the Ministry of Finance and Mass Media, participating financial institutions, and commercial and domestic sector customers increased.** This includes (i) capacity training and workshops for the MOFMM, PFIs, and developers to improve knowledge on rooftop solar systems; (ii) awareness campaigns for stakeholders and potential customers; and (iii) establishing and maintaining a comprehensive database of all installations.

D. Summary Cost Estimates and Financing Plan

14. The government has requested a regular loan of $50 million from ADB's ordinary capital resources to help finance the project. The loan will have a 30-year term, including a grace period of 7 years; an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; a commitment charge of 0.15% per year; and such other terms and conditions set forth in the draft loan agreement.[20] Based on the straight-line repayment

same holds true for Sri Lanka. ADB's Clean Energy and Network Efficiency Improvement Project in Sri Lanka that was approved in 2012 had 50% grant financing to pilot 1 MW rooftop solar photovoltaic project component.

[18] ADB. 2016. *Technical Assistance to the Democratic Socialist Republic of Sri Lanka for the Solar Rooftop Power Generation Project*. Manila (TA 9278-SRI).

[19] The design and monitoring framework is in Appendix 1.

[20] The longer loan terms would allow the use of the credit line as a revolving fund, at the government's discretion.

method, the average maturity is 18.75 years, and the maturity premium payable to ADB is 0.20% per year.

15. The summary financing plan is in Table 1. ADB will finance the eligible expenditures, including taxes and duties, leading to installation of qualified rooftop solar photovoltaic systems.[21] In cases of commercial-scale systems, an appropriate amount of equity of about 20% may be required, and additional debt may be leveraged by the PFIs, based on commercial and risk management principles.

Table 1: Summary Financing Plan

Source	Amount ($ million)	Share of Total (%)
Asian Development Bank		
Ordinary capital resources (regular loan)	50.0	83.6
Subproject equity contribution[a]	9.8	16.4
Total	**59.8**	**100.0**

[a] For commercial rooftop solar systems, an equity contribution of about 20% of the total subproject costs may be required by participating financial institutions, assuming 40% of the Asian Development Bank loan or $20 million is used for commercial rooftop solar system financing. The government will cover financing charges during implementation.

Source: Asian Development Bank estimates.

16. Climate mitigation is estimated to cost $50 million, and ADB will finance 100% of mitigation costs.

E. Implementation Arrangements

17. The implementation arrangements are summarized in Table 2 and described in detail in the project administration manual (PAM).[22]

Table 2: Implementation Arrangements

Aspects	Arrangements
Implementation period	1 January 2018–31 December 2021
Estimated completion date	31 December 2021
Estimated loan closing date	30 June 2022
Management	
(i) Oversight body	Steering committee chaired by secretary or deputy secretary, MOFMM and including representatives of MOFMM, MNPEA, MPRE, SLSEA, CEB, LECO, PUCSL, and key PFIs
(ii) Executing agency	MOFMM
(iii) Key implementing agencies	DFD of MOFMM[a]
(iv) Implementation unit	Project management unit established in DFD
Procurement	In accordance with ADB's Procurement Guidelines (2015, as amended from time to time) as applicable to financial intermediation loans.
Consulting services	No consulting services envisaged.

[21] The amount of taxes and duties (i) is within the reasonable threshold identified during the country partnership strategy preparation process, (ii) does not represent an excessive share of the project investment plan, and (iii) will only be financed in respect to ADB-financed expenditures. Financing of taxes and duties is material and relevant to the success of the project.

[22] Project Administration Manual (accessible from the list of linked documents in Appendix 2).

Aspects	Arrangements
Retroactive financing	Retroactive financing of up to 20% of the loan amount for expenditures incurred prior to loan effectiveness, but no earlier than 12 months before signing of the loan agreement.
Disbursement	The loan proceeds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2017, as amended from time to time) and detailed arrangements agreed between the government and ADB.

ADB = Asian Development Bank, CEB = Ceylon Electricity Board, DFD = Development Finance Department, LECO = Lanka Electricity Company Limited, MNPEA = Ministry of National Policies and Economic Affairs, MOFMM = Ministry of Finance and Mass Media, MPRE = Ministry of Power and Renewable Energy, PFI = participating financial institution, PUCSL = Public Utilities Commission of Sri Lanka, SLSEA = Sri Lanka Sustainable Energy Authority, TA = technical assistance.

[a] DFD has a tested track record implementing another ADB credit line for SME development (ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Technical Assistance Grant to the Democratic Socialist Republic of Sri Lanka for the Small and Medium-Sized Enterprises Line of Credit Project*. Manila).

Source: Asian Development Bank estimates.

18. The MOFMM will convert the ADB United States dollar funds at market exchange rates and provide the equivalent amount in Sri Lanka rupees to PFIs under subsidiary loan agreements. The government will be responsible for foreign exchange risk. The subsidiary loans' terms and conditions to PFIs, subject to ADB concurrence, will be based on the government's cost of ADB funds and reflect the commercial market conditions to develop the rooftop solar photovoltaic systems in Sri Lanka. ADB and the MOFMM will ensure that the selected PFIs meet ADB's requirements for integrity and anti-money-laundering assessment, and sound financial management and implementation capacity. The debt funding (through a credit line) to finance rooftop solar facilities could be used on a revolving basis, at the government's discretion, following the ADB loan closure, but maintaining the same project compliance requirements.

19. The MOFMM will establish a project management unit in the Development Finance Department that will include experienced staff and will be headed by a senior officer to administer the credit line. The Sri Lanka Sustainable Energy Authority will establish a suitable project implementation unit, staffed with consultants funded under the ADB TA, to handle technical and implementation matters (see para. 23). The Ceylon Electricity Board (CEB) and Lanka Electricity Company Limited (LECO), the only two utilities in Sri Lanka, will support project implementation by providing technical recommendations to the PFIs regarding technical proposals of the applicants, including review and approval of applications for connection of rooftop solar systems to the distribution network and confirming quality of generated power.

20. **Maximum ADB financing**. ADB does not impose any maximum subproject or subloan limits but any rooftop solar subloan application from a PFI for the financing of a subproject with a power generation capacity above 1 MW will be brought for consideration of the steering committee established under the project. ADB funds can be used to finance up to 100% of the total subproject cost for residential rooftop solar subprojects.[23] For commercial-scale rooftop solar systems with a total subproject cost of $50,000 and more, an appropriate equity contribution from the sponsor is required, to be set at a level that is commensurate with the risks of the particular subproject. The ADB loan will be disbursed consistent with the expenditure limits stated in the subsidiary loan agreements with the PFIs.

[23] The nature of the residential rooftop solar system financing is similar to those of a consumer loan, with a total cost less than the equivalent of $10,000. Therefore, equity contribution is generally not required, but this is at PFIs' own discretion.

21. **Free limit.** ADB will review at least the first three subprojects submitted by each PFI, regardless of the subproject size, or until ADB is satisfied with that PFI's ability to manage the subproject review and disbursement process. Following ADB's satisfactory approval of the first three subprojects, ADB may permit a $50,000 free limit per subloan, under which amount no prior ADB approval of the subproject is required. ADB reserves the rights to request any supporting subproject documents and not to reimburse or liquidate any subprojects that do not comply with the ADB project implementation requirements.

22. **Eligibility criteria**. ADB funds will be used to finance all types of rooftop solar subprojects that are financially sound and comply with the subproject eligibility criteria and approval procedures as outlined in the PAM.

III. ATTACHED TECHNICAL ASSISTANCE

23. Credit line implementation and monitoring will be supported by the attached TA. The TA is estimated to cost $1.0 million to be financed on a grant basis by the Asian Clean Energy Fund under the Clean Energy Financing Partnership Facility. The government will provide counterpart support in the form of counterpart staff and other in-kind contributions. The TA will address technical and implementation matters through (i) establishing technical guidelines and standards to be followed by borrowers, vendors, and accredited engineers; (ii) assisting in the development of a viable subproject pipeline to catalyze market demand for funds; (iii) supporting credit line implementation review, monitoring, and reporting; and (iv) conducting capacity building and awareness training and workshops for stakeholders. With close coordination with the MOFMM, the Ministry of Power and Renewable Energy will be the executing agency and the Sri Lanka Sustainable Energy Authority will be the implementing agency for the TA. The TA will be implemented over the period of 2 years from November 2017 to October 2019.

IV. DUE DILIGENCE

24. ADB conducted detailed due diligence on (i) confirmation of existing power system infrastructure readiness to handle the potentially rapid solar energy expansion; (ii) confirmation of general market readiness, including available policy and regulatory support, and assessment of any potential financial impact on the CEB and LECO; (iii) validation of financing models (para. 4) to ensure market demand; and (iv) reviews of project implementation capacity including that of the general finance sector and PFIs.

A. Technical

25. Technical studies for the proposed outputs were conducted by consultants engaged under the project preparatory TA financed by ADB in coordination with the CEB and LECO. Although the technical viability of rooftop solar systems has been well-established throughout the world over the past 20 years, system readiness continues to be a concern.[24] ADB reviewed and found the technical studies generally acceptable. The work undertaken indicates that the proposed technical solutions are feasible and execution arrangements are satisfactory.

B. Economic and Financial

26. An evaluation of the economic viability of the project and its expected economic performance was undertaken through a cost–benefit analysis by comparing with- and without-

[24] For example, because of periodic load shedding, inverters must be capable of disconnecting from the grid in case of grid failure, while still being able to operate and provide solar energy for captive use.

project scenarios using ADB guidelines for economic analysis. The main economic benefits are avoided fuel cost from replacement of conventional thermal generation and reduced carbon dioxide emission. The economic internal rate of return of the project was estimated at 17%, above the assumed economic hurdle rate of 9%. The capacity and financial performance of the selected PFIs are sound in terms of capital adequacy, asset quality, earnings, liquidity, and sensitivity to market risks.[25] Economic and financial internal rates of return on a set of illustrative sample subprojects based on the three rooftop solar power business models are viable.[26]

C. Governance

27. **Financial management.** A financial management assessment was conducted on the MOFMM and 10 PFIs in accordance with the ADB Guidelines for the Financial Management and Analysis of Projects (footnote 25) and Financial Management Assessment Technical Guidance Note.[27] The selection of the PFIs was mainly based on their institutional standing, existing rooftop solar lending volume, and/or established relationship with ADB through the ADB Private Sector Operations Department's Trade Finance Program[28] and ADB's Small and Medium-Sized Enterprises Line of Credit Project.[29] Other PFIs could be added during the loan implementation, subject to the government's request and the established ADB review process. The overall financial management risk for the project is assessed *moderate*. The PFIs are well regulated. Stringent project review, monitoring, and reporting requirements have been established to ensure compliance. The funds available to the PFIs will be allocated efficiently to maximize project impact (footnote 22). Candidate PFIs' basic financial strength has been assessed separately in a capital adequacy, asset quality, earnings, liquidity, and sensitivity (CAELS) assessment and is provided in the linked document.[30] The CEB and LECO could potentially be negatively affected by the rooftop solar power development over time, and this $50 million pilot project is critically important to help the government understand such an impact and explore future regulatory adjustments. The potential financial impact of expanding rooftop solar schemes on these power utilities was assessed, and relevant covenants are included in the draft loan agreement.[31]

28. **Procurement.** The MOFMM will monitor and cause the PFIs to monitor the subproject procurement by following ADB's procurement requirements applicable to financial intermediation loans. All procurement to be financed under the project will follow stated eligibility criteria. ADB encourages the MOFMM to require the PFIs and sub-borrowers to adopt internationally competitive bidding procedures to the extent possible when the amount of the investment is large and economy and efficiency can be gained through such procedures. For procurement of goods and services to be financed by subloans, the MOFMM will require the PFIs to ensure that prices are reasonable and relevant factors—time of delivery, efficiency, reliability, and suitability for the subproject—are taken into account.

29. **Anticorruption policy.** ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the MOFMM. The specific policy requirements and

[25] ADB. 2005. *Guidelines for the Financial Management and Analysis of Projects*. Manila (Section 6.4. Assessing FI Performance).
[26] Financial Analysis and Economic Analysis (accessible from the list of linked documents in Appendix 2).
[27] ADB. 2015. *Financial Management Assessment Technical Guidance Note*. Manila.
[28] Available: https://www.adb.org/sites/default/files/page/179612/tfp-issuing-banks-list-20170602.pdf.
[29] ADB. 2016. *Report and Recommendation of the President to the Board of Directors for Small and Medium-Sized Enterprises Line of Credit Project*. Manila (Loan 3370-SRI: $100 million, approved on 15 February, financed by ordinary capital resources).
[30] Financial Analysis (accessible from the list of linked documents in Appendix 2). Capital adequacy, asset quality, earnings, liquidity, and sensitivity (CAELS) assessment is a recognized international rating system of financial institutions to market risks.
[31] Analysis of the Financial Impact on Power Sector Utilities (accessible from Appendix 2).

supplementary measures are described in the PAM. They will be incorporated in the subsidiary loan agreements. The MOFMM will ensure that the PFIs follow ADB's Anticorruption Policy.

D. Poverty, Social, and Gender

30. The project supports solar energy development in Sri Lanka. The benefits of rooftop solar energy capacity additions include national benefits in terms of enhanced energy security and additional electricity supply, contributing to inclusive and environmentally sustainable economic growth, and localized benefits of improvement of livelihoods and job creation at the subproject sites. The poverty reduction impact of renewable energy projects can be both direct and indirect. The direct impact is through additional power generation, which supports economic activities and improves the livelihoods of individuals, such as the provision of lighting, refrigeration, and other household amenities. Indirectly, rooftop solar energy projects minimize negative environmental impacts and improve the health conditions of the general public.

31. The project incorporates some gender elements. ADB will conduct awareness campaigns including workshops for sector customers on a subloan application process and technical aspects of solar panel installations and operations. These workshops will target at least 30% women's participation. The draft loan agreement includes provisions on following the principles of gender equality to increase project benefits and impacts on women during project implementation.

E. Safeguards

32. In compliance with ADB's Safeguard Policy Statement (2009), the project's safeguard categories are as follows.

33. **Environment (category FI treated as C).** All project installations are limited to rooftops, and no subprojects with new grid connections that require right-of-way will be financed. Rooftop solar projects do not require an environmental clearance in Sri Lanka. After they reach the end of their economic life, the solar panel modules will be treated and disposed of in accordance with Sri Lankan laws, guidelines, and regulations. As per the occupational, safety, and health act and the regulation for the disposal of hazardous waste, health and safety issues will be properly addressed and electronic wastes will be collected, treated, or disposed of by certified licensees from the Central Environment Authority.

34. **Involuntary resettlement (category FI treated as C).** The rooftop solar systems do not require land space and have no impact on involuntary resettlement.

35. **Indigenous peoples (category FI treated as C).** The rooftop solar systems do not require land space and have no impact on indigenous peoples.

36. The environmental and social impacts associated with the implementation of rooftop solar projects, either commercial scale or residential scale, are negligible. Therefore, an environment and social safeguard management system is not required, and an environmental assessment review framework is not required because of the uniform nature of the work carried out on a country-wide basis. However, a safeguards checklist has been developed for subproject selection over the power generation capacity of 1 MW that will be screened based on the checklist to ensure that subprojects financed by the credit line have minimal or no adverse environmental, involuntary resettlement, and indigenous peoples impacts. The screening will be undertaken by ADB TA consultants who will provide necessary capacity building trainings to stakeholders including PFIs.

37. **Climate change impact.** The climate change risk screening confirms that the project has low climate change risk.

F. Summary of Risk Assessment and Risk Management Plan

38. Significant risks and mitigating measures are summarized in Table 3 and described in detail in the risk assessment and risk management plan.[32]

Table 3: Summary of Risks and Mitigating Measures

Risks	Mitigation Measures
Potential difficulties in managing the grid due to instability as a result of integrating renewable solar generation.	Intermittent wind and solar integration requirements are addressed by system stability studies prepared under the ADB TA and subsequent studies by the CEB. Investment for renewable energy integration is included in ongoing projects financed by ADB. Changes are proposed for regulatory codes and commercial arrangements.
Delays in transmission and distribution investments.	ADB will continue regular dialogue with CEB on required investments and provide timely financial assistance including cofinancing.
Untested rooftop solar market demand over the medium to long term.	The associated TA will complement the lending component with technical and implementation support for the government's rooftop solar development program. Government commitment (in terms of electricity tariffs, system infrastructure development, and budgetary support) will help strengthen market demand. ADB will work with the MOFMM to facilitate market financing and entice market demand at the PFI level.
Limited capacity and market reach of smaller PFIs to expand their rooftop solar financing.	The associated TA will provide dedicated capacity development support to PFIs, particularly those with limited capacities (e.g., limited credit assessment experience on rooftop solar lending) to ensure that all PFIs will benefit from the ADB funds.

ADB = Asian Development Bank, CEB = Ceylon Electricity Board, MOFMM = Ministry of Finance and Mass Media, PFI = participating financial institution, TA = technical assistance.
Source: Asian Development Bank estimates.

V. ASSURANCES AND CONDITIONS

39. The government has 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 detail in the PAM and loan agreement. The subsidiary loan agreements in the form and substance satisfactory to ADB will be a condition for withdrawal of loan proceeds. The government has agreed with ADB on certain covenants for the project, which are set forth in the draft loan agreement.

VI. RECOMMENDATION

40. 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 $50,000,000 to the Democratic Socialist Republic of Sri Lanka for the Rooftop Solar Power Generation Project, from ADB's ordinary capital resources, in regular terms, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 30 years, including a grace period of 7 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

4 September 2017

[32] Risk Assessment and Risk Management Plan (accessible from the list of linked documents in Appendix 2).

DESIGN AND MONITORING FRAMEWORK

Impact the Project is Aligned with Access to clean and reliable power supply in Sri Lanka increased by 2025 (Sri Lanka Energy Sector Development Plan for a Knowledge-Based Economy, 2015–2025)[a]			
Results Chain	**Performance Indicators with Targets and Baselines**	**Data Sources and Reporting Mechanisms**	**Risks**
Outcome Clean power generation enhanced.	**By 2022:** a. Rooftop solar power generation capacity increased by 50 megawatts. (2016 baseline: 30 megawatts) b. Additional 55,600 tons of carbon dioxide emissions avoided per year. (2016 baseline: 0)	a. CEB annual report (power statistics) b. SLSEA annual report	Potential difficulties in managing the grid because of instability as a result of integrating renewable solar generation. Delays in transmission and distribution investments may affect reliable connection of rooftop solar systems to the network.
Outputs 1. Debt funding for the rooftop solar power generation increased. 2. Rooftop solar market infrastructure and bankable subproject pipeline developed.	**By 2021:** 1a. About 6,400 rooftop solar subprojects financed utilizing a $50.0 million loan and $9.8 million leveraged from private sector. (2016 baseline: 0) **By 2018:** 2a. 10 PFIs for handling debt funding of rooftop solar systems by commercial and domestic sectors selected. (2016 baseline: 0) 2b. Pipeline of bankable subprojects for 50 megawatts of capacity developed. (2016 baseline: 0) 2c. Project technical guidelines and standards to be followed by borrowers, vendors, and accredited engineers established. (2016 baseline: not applicable) 2d. Technical verification during pre-installation and post-installation conducted. (2016 baseline: not applicable)	1a. MOFMM reports, CEB annual report, and LECO annual report 2a. MOFMM reports 2b. MOFMM reports, CEB annual report, LECO annual report 2c-2e. SLSEA annual report	(For all outputs) Untested rooftop solar market demand may affect timely utilization of the credit line.

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
	2e. An analytical report on identified technical shortcomings and failures prepared. (2016 baseline: not applicable)		
	By 2019:		
3. Capacity and awareness of stakeholders, including the MOFMM, PFIs, and commercial and domestic sector customers, increased.	3a. At least 80 workshop participants (30% of them women) from the MOFMM, PFIs, and developers reported improved knowledge on rooftop solar systems. (2016 baseline: not applicable)	3a. MOFMM report and statistics	
	3b. At least 150 representatives from the MOFMM, PFIs, and developers attended awareness campaigns. (2016 baseline: not applicable)	3b. MOFMM report and statistics, CEB annual report, LECO annual report	
	3c. A comprehensive database of all installations including online technical performance information of selected rooftop solar photovoltaic systems established and maintained. (2016 baseline: not applicable)	3c. SLSEA annual report	

Key Activities with Milestones

1. Debt funding for rooftop solar power generation increased

1.1 Select participating financial institutions by Q3 2017.
1.2 Issue operating guidelines to PFIs by Q3 2017.
1.3 Initiate disbursement for approved connections by Q4 2017.
1.4 Disburse first round funds by Q4 2020.

2. Rooftop solar market infrastructure and bankable subproject pipeline developed

2.1 Complete preliminary technical requirements and application templates for connection by Q4 2017.
2.2 Start processing applications and connection approvals by Q4 2017.
2.3 Finalize technical guidelines and standards by Q3 2018.
2.4 Initiate technical verification during pre-installation and post-installation by Q1 2018.
2.5. Initiate compilation and analysis of reports of technical shortcomings and failures by Q4 2018.

3. Capacity and awareness of stakeholders, including the Ministry of Finance and Mass Media, participating financial institutions, and commercial and domestic sector customers, increased

3.1 Conduct hands-on training and workshops to the implementing agency and PFIs by December 2018.
3.2 Conduct awareness campaign targeting developers and commercial and domestic customers by Q1 2018.
3.3 Establish and maintain a comprehensive database of all rooftop solar installations including on-line technical performance information of selected rooftop solar photovoltaic systems by Q4 2019.

Project Management Activities

Establish a designated project management unit in the MOFMM by July 2017.
Conduct review mission twice a year starting Q1 2018 until project physical completion.
Prepare project completion report by 2022.

Inputs ADB: $50.0 million (loan) Subproject equity contribution: $9.8 million
Assumptions for Partner Financing Not Applicable

ADB = Asian Development Bank, CEB = Ceylon Electricity Board, LECO = Lanka Electricity Company Limited, MOFMM = Ministry of Finance and Mass Media, PFI = participating financial institution, Q = quarter, SLSEA = Sri Lanka Sustainable Energy Authority.

[a] Government of Sri Lanka. 2015. *Sri Lanka Energy Sector Development Plan for a Knowledge Based Economy 2015–2025*. Colombo.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/RRPs/?id=50373-002-3

1. Loan Agreement
2. Sector Assessment (Summary): Energy
3. Project Administration Manual
4. Contribution to the ADB Results Framework
5. Development Coordination
6. Attached Technical Assistance Report
7. Financial Analysis
8. Economic Analysis
9. Country Economic Indicators
10. Summary Poverty Reduction and Social Strategy
11. Risk Assessment and Risk Management Plan

Supplementary Documents

12. Demand Analysis for Rooftop Solar Systems
13. Financial Management Assessment
14. Potential Technical Impacts of Rooftop Solar Generation on Low Voltage Distribution Networks
15. Analysis of the Financial Impact on Power Sector Utilities