Report and Recommendation of the President to the Board of Directors

Project Number: 49216-002
June 2016

Proposed Loan and Administration of Grants
Ceylon Electricity Board
Supporting Electricity Supply Reliability Improvement Project
(Guaranteed by the Democratic Socialist Republic of Sri Lanka)

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 16 June 2016)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	$0.00689
$1.00	=	SLRs145.13

ABBREVIATIONS

ADB	–	Asian Development Bank
CEB	–	Ceylon Electricity Board
CEF	–	Clean Energy Fund
CEFPF	–	Clean Energy Financing Partnership Facility
FBU	–	functional business unit
JFPR	–	Japan Fund for Poverty Reduction
ha	–	hectare
km	–	kilometer
kV	–	kilovolt
LECO	–	Lanka Electricity Company Limited
LIBOR	–	London interbank offered rate
MPRE	–	Ministry of Power and Renewable Energy
NWSDB	–	National Water Supply and Drainage Board
OCR	–	ordinary capital resources
PAM	–	project administration manual
PUCSL	–	Public Utilities Commission of Sri Lanka
SEA	–	Sustainable Energy Authority
TA	–	technical assistance

NOTE

In this report, "$" refers to US dollars.

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CONTENTS

PROJECT AT A GLANCE

1. Basic Data

Project Number: 49216-002

Project Name	Supporting Electricity Supply Reliability Improvement	**Department /Division**	SARD/SAEN
Country	Sri Lanka	**Executing Agency**	Ceylon Electricity Board, Ministry of Power and Renewable Energy
Borrower	Ceylon Electricity Board		

2. Sector

	Sector	Subsector(s)	ADB Financing ($ million)
✓	**Energy**	Electricity transmission and distribution	90.00
		Energy efficiency and conservation	20.00
		Renewable energy generation - solar	3.00
		Renewable energy generation - wind	2.00
		Total	**115.00**

3. Strategic Agenda

Strategic Agenda	Subcomponents
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive
Environmentally sustainable growth (ESG)	Eco-efficiency
	Global and regional transboundary environmental concerns

Climate Change Information

Mitigation ($ million)	25.00
CO_2 reduction (tons per annum)	9,597
Climate Change impact on the Project	Medium

4. Drivers of Change

Drivers of Change	Components
Governance and capacity development (GCD)	Institutional development
Partnerships (PAR)	Bilateral institutions (not client government)
	Official cofinancing

Gender Equity and Mainstreaming

Effective gender mainstreaming (EGM)	✓

5. Poverty Targeting

Project directly targets poverty	No

Location Impact

Rural	High
Urban	Low

6. Risk Categorization: Low

7. Safeguard Categorization

Environment: B **Involuntary Resettlement:** B **Indigenous Peoples:** C

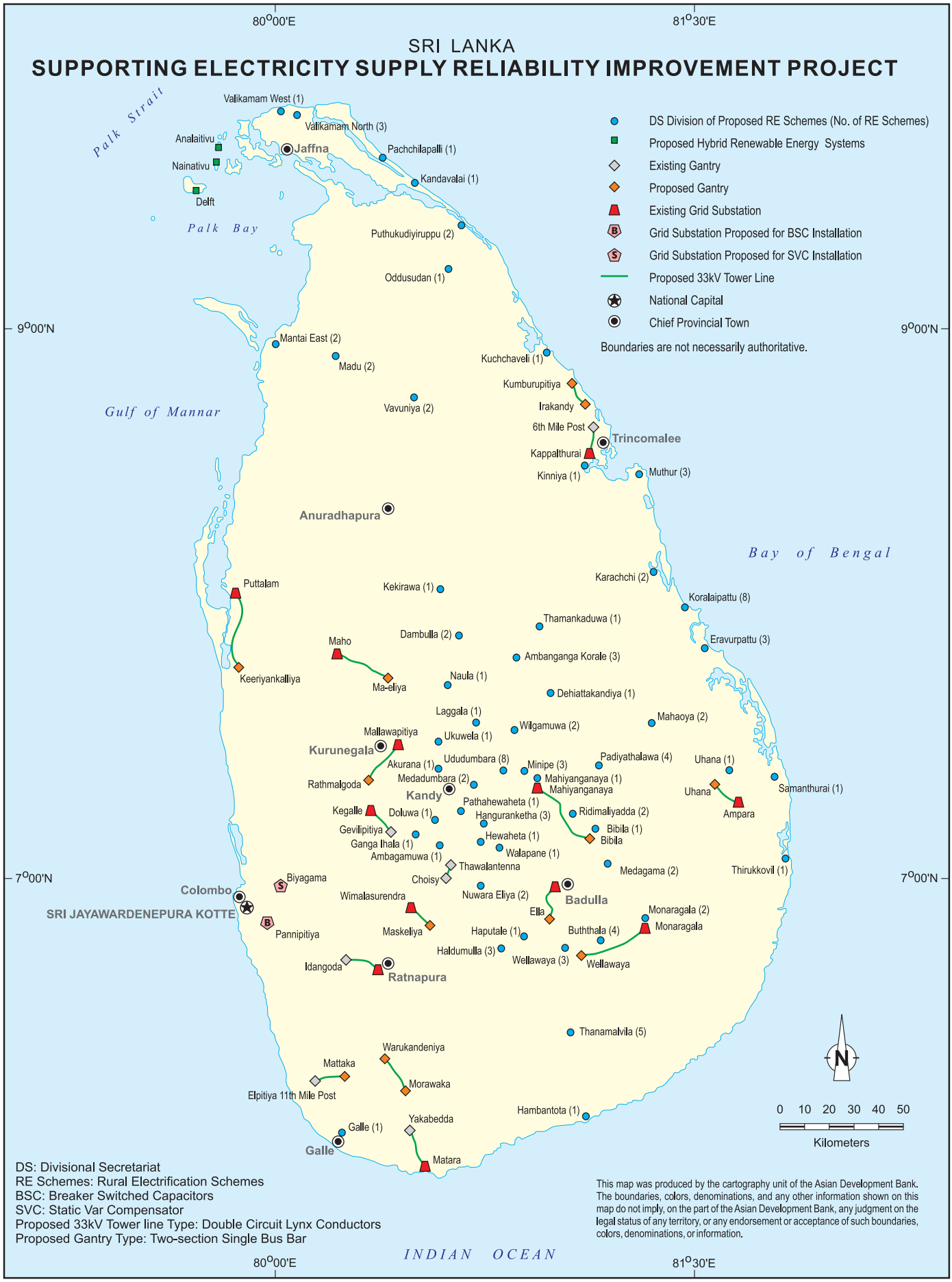
8. Financing

Modality and Sources	Amount ($ million)
ADB	**115.00**
Sovereign Project loan: Ordinary capital resources	115.00
Cofinancing	**3.80**
Japan Fund for Poverty Reduction - Grant	2.00
Clean Energy Fund under the Clean Energy Financing Partnership Facility - Grant	1.80
Counterpart	**45.20**
Government	45.20
Total	**164.00**

9. Effective Development Cooperation

Use of country procurement systems	Yes
Use of country public financial management systems	Yes

Source: Asian Development Bank


SRI LANKA
SUPPORTING ELECTRICITY SUPPLY RELIABILITY IMPROVEMENT PROJECT
80°00'E
81°30'E
9°00'N
7°00'N
Palk Strait
Palk Bay
Gulf of Mannar
Bay of Bengal
INDIAN OCEAN
Valikamam West (1)
Valikamam North (3)
Analaitivu
Jaffna
Nainativu
Delft
Pachchilapalli (1)
Kandavalai (1)
Puthukudiyiruppu (2)
Oddusudan (1)
Mantai East (2)
Madu (2)
Vavuniya (2)
Kuchchaveli (1)
Kumburupitiya
Irakandy
6th Mile Post
Trincomalee
Kappalthurai
Kinniya (1)
Muthur (3)
Anuradhapura
Puttalam
Keeriyankalliya
Kekirawa (1)
Maho
Ma-eliya
Dambulla (2)
Naula (1)
Karachchi (2)
Koralaipattu (8)
Thamankaduwa (1)
Eravurpattu (3)
Ambanganga Korale (3)
Dehiattakandiya (1)
Laggala (1)
Wilgamuwa (2)
Mahaoya (2)
Mallawapitiya
Kurunegala
Ukuwela (1)
Akurana (1)
Ududumbara (8)
Minipe (3)
Padiyathalawa (4)
Uhana (1)
Rathmalgoda
Medadumbara (2)
Kandy
Mahiyanganaya (1)
Mahiyanganaya
Uhana
Samanthurai (1)
Ampara
Pathahewaheta (1)
Kegalle
Doluwa (1)
Hanguranketha (3)
Ridimaliyadda (2)
Bibila (1)
Bibila
Gevilipitiya
Ganga Ihala (1)
Hewaheta (1)
Ambagamuwa (1)
Walapane (1)
Thawalantenna
Medagama (2)
Thirukkovil (1)
Biyagama
Colombo
SRI JAYAWARDENEPURA KOTTE
Choisy
Nuwara Eliya (2)
Badulla
Ella
Wimalasurendra
Maskeliya
Pannipitiya
Haputale (1)
Buththala (4)
Monaragala (2)
Monaragala
Haldumulla (3)
Wellawaya (3)
Wellawaya
Idangoda
Ratnapura
Thanamalvila (5)
Warukandeniya
Mattaka
Morawaka
Elpitiya 11th Mile Post
Hambantota (1)
Yakabedda
Galle (1)
Galle
Matara
DS Division of Proposed RE Schemes (No. of RE Schemes)
Proposed Hybrid Renewable Energy Systems
Existing Gantry
Proposed Gantry
Existing Grid Substation
Grid Substation Proposed for BSC Installation
Grid Substation Proposed for SVC Installation
Proposed 33kV Tower Line
National Capital
Chief Provincial Town
Boundaries are not necessarily authoritative.
N
0 10 20 30 40 50
Kilometers
DS: Divisional Secretariat
RE Schemes: Rural Electrification Schemes
BSC: Breaker Switched Capacitors
SVC: Static Var Compensator
Proposed 33kV Tower line Type: Double Circuit Lynx Conductors
Proposed Gantry Type: Two-section Single Bus Bar
This map was produced by the cartography unit of the Asian Development Bank. The boundaries, colors, denominations, and any other information shown on this map do not imply, on the part of the Asian Development Bank, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.
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I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to Ceylon Electricity Board (CEB) with a sovereign guarantee from the Democratic Socialist Republic of Sri Lanka for the Supporting Electricity Supply Reliability Improvement Project.[1] The report also describes (i) the proposed administration of a grant to be provided by the Clean Energy Fund[2] under the Clean Energy Financing Partnership Facility, and (ii) the proposed administration of a grant to be provided by the Japan Fund for Poverty Reduction, both to the Democratic Socialist Republic of Sri Lanka for the Supporting Electricity Supply Reliability Improvement 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 grants for the project.

2. The project includes (i) renewable energy systems development—consisting of establishing hybrid renewable energy systems in small isolated islands, a renewable energy micro-grid system, and support for productive energy use for small isolated island and rural communities; (ii) reliability improvement of the medium voltage network; (iii) rural electrification and distribution performance monitoring improvement; and (iv) reactive power management in the transmission system in the Central, Eastern, Northern, North Central, North Western, Uva, Sabaragamuwa, Southern, and Western provinces.[3]

II. THE PROJECT

A. Rationale

3. **Development problem.** Sri Lanka has improved its energy sector performance, and achieved a national electrification ratio of 98% in 2014 compared with 29% in 1990. The remaining 2% of electrification is the most difficult to accomplish, and is mainly in underdeveloped areas and small isolated islands around the country. Although some provinces have achieved 100% electrification, the former conflict-affected Northern and Eastern provinces have only 92% and 94% electrification; and Uva and North Central provinces achieved 95%, with several districts falling well below this level.[4] Improvement of the 33-kilovolt (kV) medium voltage network is needed to ensure system reliability and expand power supply into these rural areas, where many poor households remain unconnected and those connected have poor quality of electricity supply. Several small isolated islands with a population of 1,800–4,500 people cannot be provided with electricity through extension of the grid. These islands are supplied by expensive electricity generated by inefficient, old diesel generation sets that provide electricity for limited hours during the day, with an electrification ratio of 38%–60%.

4. The Government of Sri Lanka aims to ensure sustainable development of energy resources by improving the power supply systems to provide access to electricity services to the entire population. Sri Lanka has a national investment program, including sector investments that are based on the National Energy Policy and Strategies.[5] The National Energy Policy and Strategies includes a sector road map, a long-term investment plan, and policy and reform measures. The country's installed generation capacity of 3,932 megawatts produces 12,357

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[1] The design and monitoring framework is in Appendix 1.
[2] Financing partners: the governments of Australia, Norway, Spain, Sweden, and the United Kingdom.
[3] The Asian Development Bank (ADB) provided project preparatory technical assistance (TA) for Preparing the Supporting Electricity Supply Reliability Improvement Project (TA 8952-SRI).
[4] The 2015 electrification rate is 85% in Mannar district, 75% in Kilinochchi district, and 80% in Mulathivu district, all in the Northern Province. The 2015 electrification rate in Batticaloa district of the Eastern Province is 89%.
[5] Government of Sri Lanka. 2008. *National Energy Policy and Strategies of Sri Lanka*. Colombo.

gigawatt-hours of electricity (2014),[6] adequately covering current demand. Generation capacity is sufficient to expand electricity supply further. The government intends to provide electricity to the population through the grid on the main island and mini-grid systems on small isolated islands. The project will contribute to the government's goal of expanding access to electricity and developing clean energy.

5. **Project's value addition**. The project will directly benefit the development of lagging areas. It will cover 106 rural electrification schemes[7] and 2,372 kilometers (km) of low voltage line extensions. Innovative hybrid mini grids, consisting of wind–solar and efficient diesel generation systems coupled with energy storage (lithium-ion batteries), will be implemented in the small isolated islands.[8] As a result, the project will help to ensure inclusiveness and access to electricity by all the population. The project is expected to provide electricity to about 35,710 rural households,[9] including the former conflict-affected Northern and Eastern provinces as well as Uva and North Central provinces where the current electrification level is lower than in other parts of the country. Improvement of the medium voltage network will enhance the quality and reliability of electricity supply to more than 493,000 consumers. The project is consistent with the interim country partnership strategy for Sri Lanka of the Asian Development Bank (ADB).[10] It builds on previous ADB interventions focused on supporting transmission and distribution investments to expand access to clean and reliable electricity, and renewable energy development.[11]

B. Impact and Outcome

6. The impact will be increased access to clean, reliable, and affordable power supply aligned with the National Energy Policy and Strategies of Sri Lanka (footnote 5). The outcome will be enhanced electricity supply, and distribution system efficiency and reliability.

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[6] Ceylon Electricity Board. 2015. *Statistical Digest 2014.* Colombo.

[7] A rural electrification scheme consists of a dedicated medium voltage (33 kV) line connected to a distribution substation and a low voltage distribution network to supply electricity to customers in a specific rural area around the substation.

[8] A pilot hybrid mini-grid system subproject is being implemented on Elevaithivu Island under ADB. 2009. *Technical Assistance for Effective Deployment of Distributed Small Wind Power Systems in Asian Rural Areas.* Manila (TA 7485-REG). The pilot subproject helps CEB, the implementing agency, to build capacity for implementing similar innovative subprojects under the proposed loan.

[9] In addition, 2,871 rural households will benefit from the implementation of the hybrid mini-grid systems in small isolated islands.

[10] ADB. 2015. *Interim Country Partnership Strategy: Sri Lanka, 2015–2016*. Manila.

[11] ADB financed strengthening transmission infrastructure for hydropower evacuation from the Central Province to load centers under ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Loans, Grant, Administration of Grant, and Technical Assistance Grant to the Democratic Socialist Republic of Sri Lanka for the Clean Energy and Access Improvement Project*. Manila; and ADB. 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loans and Administration of Technical Assistance Grant to the Democratic Socialist Republic of Sri Lanka for the Sustainable Power Sector Support Project*. Manila. 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 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. 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 finances hydropower development, transmission and medium voltage network improvements, and energy efficiency through innovative demand-side management pilot subprojects. Under the project preparatory TA for Preparing the Clean Energy and Network Efficiency Improvement Project (TA 7837-SRI), ADB supported actual wind measurements and wind resource assessment at the proposed 375 megawatt wind park site at Mannar, Northern Province. A system stability study and a country renewable energy master plan, along with a master plan and a business model of the proposed wind parks, were prepared with the support of the TA for Capacity Building for Clean Power Development (TA 8167-SRI).

C. Outputs

7. The project will have the following outputs:[12]

(i) **Renewable energy systems established.** This involves (a) establishing hybrid renewable energy systems, consisting of wind, solar, efficient diesel generators, and battery storage; (b) support for productive energy use for small isolated island and rural communities on three islands in the Jaffna area of the Northern Province (Analativu, Delft, and Nainativu); and (c) a renewable energy micro-grid system in the Western Province.

(ii) **Reliability of the medium voltage network improved.** This involves (a) construction of 270.5 km of 33 kV tower lines, 80.0 km of 33 kV aerial bundled conductor lines, and 13 of 33 kV gantries; and (b) installation of 175 of 33 kV load-break switches and 25 of 33 kV auto reclosers.

(iii) **Rural electrification network extended and distribution performance monitoring improved.** This involves (a) construction of 1,979 km of low voltage line extensions; (b) 106 rural electrification schemes, comprising 106 of 100 kilovolt-ampere distribution substations, 198 km of dedicated 33 kV lines, and 393 km of low voltage lines to connect rural households to the grid; and (c) installation of 25,000 programmable distribution substation meters with a remote meter-reading facility.

(iv) **Reactive power management in the transmission system improved.** This includes installation of (a) 100 megavolt-ampere reactive breaker-switched capacitors at the 132 kV bus bar of the existing Pannipitiya grid substation; and (b) a +100/–50 megavolt-ampere reactive static var compensator at the 220 kV bus bar of the existing Biyagama grid substation for voltage control during dynamic conditions.

8. The renewable energy interventions include an innovative renewable energy-based micro-grid pilot subproject to be financed by the investment grant of $1.8 million equivalent from the Clean Energy Fund (CEF) under the Clean Energy Financing Partnership Facility (CEFPF), to be administered by ADB. The micro-grid concept will be implemented for the first time in Sri Lanka. It will support an innovative approach for optimization of cost-effective operation of loads and resources, and for the reduction of burden on the national grid. The pilot subproject's scope includes (i) the preparation of a feasibility study and detailed design of the pilot subproject; (ii) capacity building in the design and implementation of micro-grids in the distribution system; and (iii) establishing an alternate current–direct current 300-kilowatt micro-grid system, including solar photovoltaic power generation and battery storage, with the capability to supply loads from both alternate current and direct current bus bars. The pilot subproject's results will contribute to the development of interconnection standards and operation guidelines for the renewable energy micro-grid to facilitate replication in the future.

9. Additional support for ensuring the sustainability of the hybrid renewable energy systems in the small isolated islands will be provided through grant-financed activities for $2 million equivalent from the Japan Fund for Poverty Reduction (JFPR), to be administered by ADB. This aims to improve livelihoods in local communities, including women, through (i) training in the safe use of electricity equipment; (ii) training in the productive use of income opportunities created as a result of access to electricity; (iii) increasing employment in local communities to work as a maintenance crew for simple and routine repairs, as well as operation and maintenance of hybrid renewable energy systems and other facilities; and (iv) developing

[12] Detailed Description of Project Components (accessible from the list of linked documents in Appendix 2).

additional infrastructure (i.e., a small seawater desalination plant, small water storage tanks, an ice-making factory, refrigeration facilities, and public street lighting).[13]

D. Investment and Financing Plans

10. The project is estimated to cost $164 million (Table 1).

Table 1: Project Investment Plan
($ million)

Item		Amount[a]
A.	**Base Cost**[b]	
	1. Renewable energy systems	9.9
	2. Reliability improvement of medium voltage networks	51.5
	3. Rural electrification and distribution performance monitoring	49.9
	4. Reactive power management	28.0
	Subtotal (A)	**139.3**
B.	**Contingencies**[c]	**18.1**
C.	**Financing Charges During Implementation**[d]	**6.6**
	Total (A+B+C)	**164.0**

[a] In fourth quarter of 2015 prices.
[b] Includes incremental (e.g., land acquisition, and environmental and social mitigation) cost of $1.7 million to be financed by Ceylon Electricity Board. Also includes taxes and duties of $25.8 million to be financed from government and Ceylon Electricity Board resources.
[c] Physical contingencies computed at 5% of base cost. Price contingencies computed using the Asian Development Bank's forecasts of international and domestic inflation. Includes provision for potential exchange rate fluctuation under the assumption of a purchasing power parity exchange rate.
[d] For the ordinary capital resources components, interest during implementation is computed at the 5-year swap rate for the London interbank offered rate (LIBOR) for US dollars as of January 2016 (1.72%) plus an effective contractual spread of 50 basis points and a maturity premium of 10 basis points. Commitment charges for an ordinary capital resources loan are computed at 0.15% per year to be charged on the undisbursed loan amount.
Sources: Ceylon Electricity Board and Asian Development Bank estimates.

11. To finance the project, the government requested (i) a $115 million loan from ADB's ordinary capital resources (OCR) to be provided to CEB under the sovereign guarantee, (ii) a grant not exceeding the equivalent of $1.8 million from the CEF under the CEFPF for the renewable energy micro-grid pilot subproject, and (iii) a grant not exceeding the equivalent of $2 million from JFPR for productive energy use for small isolated island and rural communities; both grants to be administered by ADB. The financing plan is in Table 2.

12. The OCR loan will have a 25-year term, including a grace period of 5 years, a straight-line repayment method, an annual interest rate determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility,[14] a commitment charge of 0.15% per year, the interest during construction to be capitalized in the loan, and such other terms and conditions set forth in the draft loan agreement.

[13] Productive Energy Use for Small Isolated Island and Rural Communities (accessible from the list of linked documents in Appendix 2).
[14] The interest includes a maturity premium of 10 basis points payable to ADB since the OCR loan has an average loan maturity of 15.25 years based on the above loan terms and CEB's choice of repayment option and dates.

Table 2: Financing Plan
($ million)

Source		Amount ($ million)	Share of Total (%)
A.	**Asian Development Bank**		
	Ordinary capital resources loan	115.0	70.1
	Clean Energy Fund[a] under the Clean Energy Financing Partnership Facility grant	1.8	1.1
	Japan Fund for Poverty Reduction[b] grant	2.0	1.2
	Subtotal (A)	**118.8**	**72.4**
B.	**Government and Ceylon Electricity Board**	**45.2**	**27.6**
	Total (A+B)	**164.0**	**100.0**

[a] Financing partners: the governments of Australia, Norway, Spain, Sweden, and the United Kingdom. Administered by the Asian Development Bank.
[b] Administered by the Asian Development Bank.
Sources: Ceylon Electricity Board and Asian Development Bank estimates.

13. The government and CEB will finance taxes and duties. CEB will also finance a portion of contingencies; costs of land acquisition, environmental and social mitigation, and other incremental costs; and civil works for the rural electrification and distribution performance monitoring component.

E. Implementation Arrangements

14. CEB will be the executing and implementing agency for the components to be financed by the loan. The Ministry of Power and Renewable Energy (MPRE) will be the executing agency for the two grant components. Lanka Electricity Company Limited (LECO) will be the implementing agency for the micro-grid pilot subproject, while the Sustainable Energy Authority (SEA) and the National Water Supply and Drainage Board (NWSDB) will be the implementing agencies for the grant component for improving livelihoods in local communities. For this grant component, NWSDB will be responsible for the development of additional infrastructure—a water desalination plant, an ice-making factory, and small water storage tanks. ADB will enter into a grant agreement with Sri Lanka, and a project agreement with LECO, for the CEF under the CEFPF grant; and a grant agreement with Sri Lanka, and a project agreement with SEA and NWSDB, for the JFPR grant. A steering committee, chaired by the MPRE secretary, will guide CEB, LECO, SEA, and NWSDB; and review progress and results. CEB, LECO, SEA, and NWSDB will set up project management units. The units will oversee procurement, disbursement, financial management and accounting, quality assurance, and social and environmental issues; and will coordinate with the procurement committee, appointed by the cabinet or MPRE, depending on the contract size. Full-time managers will supervise each project component.

15. The government and CEB have asked ADB to approve advance contracting for the procurement of goods and civil works, including preparing bidding documents, and inviting and receiving bids for project contracts, and retroactive financing under the project. Retroactive financing will be allowed for up to 20% of the loan amount for expenditures incurred prior to loan effectiveness, but no earlier than 12 months before the signing of the loan agreement. The government and CEB were advised that ADB's approval of advance contracting and retroactive financing in principle does not commit ADB to finance any part of the project. The implementation arrangements are summarized in Table 3 and described in detail in the project administration manual (PAM).[15]

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

Table 3: Implementation Arrangements

Aspects	Arrangements		
Implementation period	1 October 2016–30 September 2021		
Estimated completion date	30 September 2021		
Estimated loan and grant closing date	31 March 2022		
Management			
(i) Oversight body	Steering committee consisting of the secretary, MPRE (chair), and representatives of MOF, MNPEA, MPRE, CEB, LECO, SEA, and NWSDB (members)		
(ii) Executing agency	MPRE (for grant-financed components), CEB (for loan-financed components)		
(iii) Key implementing agencies	CEB (for loan-financed components); LECO, SEA, and NWSDB (for grant-financed components)		
(iv) Project management unit	Established in CEB, LECO, SEA, and NWSDB		
Procurement	International competitive bidding	8 procurement packages	$93.47 million
	National competitive bidding	1 procurement package[a]	$5.79 million
Consulting services	Quality- and cost-based selection	44 person-months	$0.70 million
	Individual	15 person-months	$0.38 million
Retroactive financing and/or advance contracting	Advance contracting, including preparation of bidding documents, inviting and receiving bids for contracts, and retroactive financing of up to 20% of the loan amount for expenditures incurred prior to loan effectiveness, but no earlier than 12 months before the signing of the loan agreement.		
Disbursement	The loan and grant proceeds will be disbursed in accordance with ADB's *Loan Disbursement Handbook* (2015, as amended from time to time) and detailed arrangements agreed between the government, CEB, LECO, SEA, NWSDB, and ADB.		

ADB = Asian Development Bank, CEB = Ceylon Electricity Board, LECO = Lanka Electricity Company Limited, MOF = Ministry of Finance, MNPEA = Ministry of National Policies and Economic Affairs, MPRE = Ministry of Power and Renewable Energy, NWSDB = National Water Supply and Drainage Board, SEA = Sustainable Energy Authority.
[a] The procurement package includes concrete poles that are normally manufactured and supplied locally.
Source: Asian Development Bank estimates.

III. DUE DILIGENCE

A. Technical

16. CEB and LECO conducted technical studies for the proposed components with support from ADB technical assistance.[16] ADB followed up with its own assessment and found the technical studies generally acceptable. CEB prepared the preliminary designs of the hybrid renewable energy systems in three small islands with the support of ADB consultants. The feasibility study and detailed design of the micro-grid pilot subproject will be prepared with the support of consultants to be engaged under the CEF grant by LECO. The detailed design of the small seawater desalination plant will be prepared with consultant support by NWSDB under the

[16] ADB. 2015. *Technical Assistance to the Democratic Socialist Republic of Sri Lanka for Supporting Electricity Supply Reliability Improvement Project.* Manila (TA 8952-SRI for $225,000, approved on 14 September 2015, and financed on a grant basis by ADB's Technical Assistance Special Fund [TASF-V]).

JFPR grant. The work undertaken indicates that the proposed technical solutions are feasible and execution arrangements are satisfactory.

B. Economic and Financial

17. The project will benefit electricity consumers and the overall economy through improved supply reliability, reduced consumption of conventional fuels, and incremental consumption. The economic viability of the project has been examined through a cost–benefit analysis, by comparing with- and without-project scenarios, conducted using ADB guidelines for economic analysis.[17] All project components have been confirmed as least-cost, with sound economic rationale for investment. The aggregate economic internal rate of return is estimated at 13.1%, above the assumed hurdle rate of 12.0% and, on this basis, the overall project is economically viable. A sensitivity and risk analysis demonstrates adequate economic performance for the project. The renewable energy and rural electrification components have slight sensitivity to a variation in certain project parameters, reflecting an economic internal rate of return below the hurdle rate as a result of higher costs for the "last mile" electrification.[18]

18. Financial viability was examined by comparing the incremental costs and benefits on a with- and without-investment basis using ADB guidelines.[19] The real weighted average cost of capital was calculated for each component and resulted in 2.6% average costs for the overall project. Financial viability was assessed by comparing the weighted average cost of capital with the financial internal rate of return for each component and for the overall project. The aggregate financial internal rate of return is 3.2%, which is slightly higher than the weighted average cost of capital of 2.6%, suggesting that the overall project is marginally viable. Sensitivity analysis shows that the estimated financial returns are sensitive to cost overruns or implementation delays that are excluded from the regulated revenue of CEB and LECO.[20]

C. Governance

19. CEB and LECO are the only two power utilities in the country. SEA is the government agency responsible for energy efficiency and renewable energy development, and NWSDB is the government agency responsible for water supply. The government and CEB own most of LECO's shares; municipalities and the Urban Development Authority are minority shareholders. As a distribution company, LECO operates based on a separate license and demonstrates profitability. CEB is a vertically integrated utility comprising six functional business units (FBUs). The Sri Lanka Electricity Act, 2009 encourages efficiency improvements of CEB by regulating each FBU. The act empowers the Public Utilities Commission of Sri Lanka (PUCSL), an independent regulator for energy and water established under the PUCSL Act, 2002, to regulate the electricity supply industry. PUCSL began regulating each FBU separately and issued individual licenses in 2009. It established a tariff methodology and a road map for tariff reforms and rebalancing in 2011. Financial accounts are segregated to allow each FBU to operate as a profit center, and a transfer-pricing scheme between FBUs was developed. However, the process of the delegation of day-to-day management and financial decision making to FBU heads is not complete, and the transfer-pricing scheme between FBUs is not functioning properly.

20. LECO, SEA, and NWSDB—which will implement the grant-financed components—have the necessary experience and capacity to undertake activities envisaged under the grants. CEB

[17] Economic Analysis (accessible from the list of linked documents in Appendix 2).
[18] The "last mile" is defined as the last stage in providing services to consumers that has proved to be expensive.
[19] Financial Analysis (accessible from the list of linked documents in Appendix 2).
[20] The energy sector regulator allows utilities to earn annual revenue according to a revenue control formula that excludes cost overruns or implementation delays and is defined in the approved tariff methodology.

has the necessary capacity to undertake the project. It was the implementing agency for past ADB-financed projects and has managed investments funded by other development partners. The financial management assessment of CEB concludes that it can fulfill ADB's fiduciary requirements for the project. CEB regularly faces cash shortfalls because of low tariffs, expensive power generation, and expensive short-term loans. These shortcomings need to be corrected. Under the 2009 act, all tariffs must reflect costs and the Treasury will bear the cost of any government-approved subsidy. In March 2008, the government introduced a new tariff structure that increased average retail tariffs by 30%. The tariff order issued by PUCSL in January 2011 increased the average electricity tariff by about 8%. In February 2012, PUCSL implemented a fuel adjustment formula for certain customer categories. In April 2013, retail electricity tariffs were increased by 35% on average. The government has also converted CEB's long-term debt into equity.

21. The financial management capacity of all four implementing agencies is assessed as acceptable for the project. In the case of CEB, the overall risk is assessed as moderate and several risk mitigation measures will be implemented. The overall risk has been assessed as low for LECO, SEA, and NWSDB. Details of the financial management assessments of CEB, LECO, SEA, and NWSDB are in the PAM and in the assessment of CEB's financial performance and projections.[21] CEB's financial performance has improved to some extent in 2014–2015. However, its ongoing financial sustainability will depend on the extent to which it is allowed to charge its customers fully cost-reflective tariffs to service debt and to undertake a prudent capital and operating expenditure program. Based on the government's request to lend directly to CEB for the project under the sovereign guarantee, specific financial management covenants are included in the draft legal agreements.

22. All procurement will be carried out in accordance with ADB's Procurement Guidelines (2015, as amended from time to time). Recruitment of consultants will be in accordance with ADB's Guidelines on the Use of Consultants (2013, as amended from time to time). An oversight role by ADB will ensure integrity in procurement and implementation activities. CEB maintains a project website that will be updated regularly and will include (i) bidding procedures, bidders, and contract awards; (ii) use of funds disbursed under the project; and (iii) physical progress. ADB's Anticorruption Policy (1998, as amended to date) was explained to and discussed with the government, CEB, LECO, SEA, and NWSDB. The specific policy requirements and supplementary measures are described in the PAM (footnote 15).

D. Poverty and Social

23. The project will contribute to sustainable economic development, poverty reduction, and social well-being through increased access to electricity, and improvement in the reliability and quality of power supply. Greater access to a stable supply of electricity will promote business expansion and increase jobs, which will help reduce poverty. Electricity generated by the renewable energy systems will be used to produce drinking water at the seawater desalination plant, and ice for fish and food storage at the ice-making factory that will be constructed on Nainativu island, to address the immediate needs of poor households. The project is expected to generate jobs for skilled and unskilled laborers during construction and throughout the operation of the established renewable energy systems, water desalination plant, and ice-making factory in the small islands. Reliability improvement of the 33 kV network will enhance the quality and reliability of the electricity supply to more than 493,000 consumers, and rural electrification extension will provide access to electricity for about 35,710 households in rural

[21] The summary of CEB's historical financial performance and projections is in Financial Analysis (accessible from the list of linked documents in Appendix 2).

areas. Improved access to electricity and better supply quality will also enhance the living standards of rural households.

E. Safeguards

24. **Environment.** The project investments are classified as category B for environment.[22] Major components include the construction of 33 kV tower lines, gantries, and hybrid renewable generation systems where construction work is limited to building foundations for transmission towers, gantries, and small renewable energy systems. CEB, LECO and NWSDB have adequate institutional capacity, commitment, and experience to manage environmental risks during the construction and operation of project facilities. Potential environmental impacts are mostly temporary, predictable, reversible, and can be mitigated; and sensitive ecosystems will not be impacted. Environmental management plan mitigation measures will be incorporated into civil works contracts, giving contractors the primary responsibility for implementation during construction. CEB, LECO, and NWSDB will supervise construction and environmental management plan implementation. The contractors, CEB, LECO, and NWSDB will adhere to ADB's Safeguard Policy Statement (2009) and national environmental regulations.

25. **Involuntary resettlement.** The project is classified as category B for involuntary resettlement.[23] No physical displacement is envisaged. Some 0.600 hectares (ha) of private land will be acquired (0.10% of the total 546.24 ha of land required) and 0.038 ha of land will be lost to tower footing (0.06% of the total land required). Twelve households will be affected by the land acquisition and about 480 households will be affected by the right-of-way, but none will lose 10% or more of productive assets. The project's social impacts have been adequately assessed. Where new gantries are built on commercial and private land, compensation will be paid to the owners at replacement cost. Distribution transformers will be mainly mounted on poles. Transmission and distribution lines primarily cross public and unused lands. Construction will be carried out during non-cropping seasons. Where cropland is affected, compensation at replacement cost will be paid. Budgetary provisions are in place to compensate affected people in a timely manner for these losses if and when they occur. A resettlement plan has been prepared that is adequate to address the assessed risk. CEB has implemented several ADB projects and is capable of conducting resettlement in accordance with ADB's Safeguard Policy Statement. Special attention will be paid to addressing gender equity issues in the resettlement plan. Additional assistance will be given to vulnerable households, including those headed by women. Social surveys and consultations were undertaken in accordance with ADB's Safeguard Policy Statement. The loan agreement will include a standard assurance related to core labor standards for contractors, including equal pay for equal types of work, and an awareness program on HIV/AIDS and sexually transmitted diseases. The project is classified as category C for indigenous peoples, as no indigenous peoples will be affected.

26. **Climate change impact.** The project's renewable energy interventions will bring an additional 2.16 gigawatt-hours of wind and solar power generation to the electricity supply system per year and result in avoiding about 2,697 tons of carbon dioxide emissions per year for the useful life of the plants. The new medium voltage lines constructed to improve reliability of electricity supply in rural areas will help to avoid generation of 19 gigawatt-hours per year, equivalent to preventing 6,900 tons of carbon dioxide emissions per year, adjusted for emissions of additional electricity consumption by new customers. The climate change risk screening confirms that the project components have moderate climate change risks.[24]

[22] Initial Environmental Examination (accessible from the list of linked documents in Appendix 2).
[23] Resettlement Plan (accessible from the list of linked documents in Appendix 2).
[24] Project Climate Risk Assessment and Management Report (accessible from the list of linked documents in Appendix 2).

F. Risks and Mitigating Measures

27. Governance risk stems from CEB having insufficient cash to fund its operations (para. 20). Risks to project implementation include delays in generation and transmission investments that may impact improvements in electricity supply and reliability of the distribution network, and cost escalation. These risks appear to be moderate and may be mitigated by (i) ensuring progress on power sector reforms, government efforts to increase supply capacity and reduce generation costs, and improving CEB's corporate financial management; (ii) timely implementation of CEB's long-term generation and transmission investment plans; and (iii) closely supervising implementation and advance contracting. The integrated benefits and impacts are expected to outweigh the mitigation costs. Major risks and mitigating measures are summarized in Table 4 and described in detail in the risk assessment and risk management plan.[25]

Table 4: Summary of Risks and Mitigating Measures

Risks	Mitigating Measures
Insufficient cash generation by Ceylon Electricity Board to fund its operations	Progress on energy sector reforms, including an independent energy sector regulatory framework, rationalizing tariff structures, and internal structural reforms in Ceylon Electricity Board; improving Ceylon Electricity Board's corporate financial management; and commissioning low-cost generation, including from hydropower and other renewable energy sources
Delays in generation and transmission investments	Timely implementation of Ceylon Electricity Board's long-term generation and transmission investment plans
Cost escalation including unexpected increase in prices of commodities and raw materials	Close supervision by the steering committee and the Asian Development Bank, open and transparent competitive bidding, proactive project implementation, advance contracting, inclusion of physical and price contingencies in the cost estimates

Source: Asian Development Bank estimates.

IV. ASSURANCES

28. The government and CEB 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 detail in the PAM and loan documents. The government and CEB have agreed with ADB on certain covenants (including operational and corporate financial management covenants) for the project, which are set forth in the legal agreements.

V. RECOMMENDATION

29. 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 $115,000,000 to Ceylon Electricity Board, to be guaranteed by the Democratic Socialist Republic of Sri Lanka, for the Supporting Electricity Supply Reliability Improvement Project, from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; for a term of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft loan and guarantee agreements presented to the Board.

Takehiko Nakao
President

29 June 2016

[25] 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, reliable, and affordable power supply in Sri Lanka increased by 2020 (*National Energy Policy and Strategies of Sri Lanka*)[a]

Results Chain	**Performance Indicators with Targets and Baselines**	**Data Sources and Reporting Mechanisms**	**Risks**
Outcome Electricity supply, and distribution system efficiency and reliability enhanced	By 2021: a. Electrification rate increased to 100% (2014 baseline: 98%) b. Additional 35,710 rural households connected to electricity (2015 baseline: 0) c. Energy supply from nonconventional renewable energy sources increased to 20.0% (2014 baseline: 9.8%) d. System losses of CEB network reduced to 10.00% of net generation (2014 baseline: 10.47%) e. Distribution line-end voltage fluctuation maintained within 5% in project areas (2014 baseline: 10%)	a–e. CEB annual report (power statistics) CEB monthly system reports	Delays in generation and transmission investments may impact improvements in electricity supply and reliability of the distribution network. Insufficient cash generation may impact CEB's ability to fund its operations.
Outputs 1. Renewable energy systems established	By 2020: 1a. Total 2.27 megawatts of hybrid mini-grid systems with 900 kilowatt-hour storage capacity established in three small islands (2015 baseline: 0) 1b. 300 kilowatt renewable energy micro-grid system established (2015 baseline: 0) 1c. Additional 9,597 tons of carbon dioxide emissions avoided per year (2015 baseline: 0) 1d. 10 LECO staff (30% women) trained in design of micro grids (2015 baseline: 0) 1e. Additional infrastructure (a 100,000 liters/day seawater desalination plant, an ice-making factory, water storage tanks) in three islands developed (2015 baseline: 0) 1f. 100% of below-poverty line (50% women's participation) households trained in safe use of electrical equipment (2015 baseline: 0) 1g. 100% of below-poverty line households (20% headed by women) trained in productive use	1a and 1c. CEB annual report 1b–d. LECO annual report 1e. National Water Supply and Drainage Board annual report 1f–h. Sustainable Energy Authority annual report	(For all outputs) Unexpected increase in prices of commodities and raw materials, and construction delays impact the work.

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
	of income opportunities emerging with the electricity access, targeting establishment of 50 microenterprises (2015 baseline: 0) 1h. 100% of below-poverty line (50% women's participation) households trained in technical skills to avail of employment and livelihood opportunities as a maintenance crew for simple and routine electrical repairs, and operation and maintenance of hybrid systems and other facilities (2015 baseline: 0)		
2. Reliability of the medium voltage network improved	By 2020: 2a. Additional 270.5 km of 33 kV tower lines, 80 km of aerial bundled conductor lines, and 13 of 33 kV gantries constructed (2015 baseline: 0) 2b. Installation of additional 175 33 kV load-break switches and 25 auto reclosers completed (2015 baseline: 0)	2a–b. CEB annual report	
3. Rural electrification network extended and distribution performance monitoring improved	By 2020: 3a. Construction of additional 198 km of dedicated 33 kV lines, 393 km of low voltage lines to connect rural households to the grid, and 1,979 km of low voltage line extensions completed (2015 baseline: 0) 3b. Installation of 25,000 programmable distribution substation meters completed (2015 baseline: 56) 3c. 600 people (50% women) trained in safe and efficient use of electricity, and technical skills to avail of employment and livelihood opportunities (2015 baseline: 0)	3a–c. CEB annual report	
4. Reactive power management in the transmission system improved	By 2020: 4a. 100 megavolt-ampere reactive breaker-switched capacitors installed in Pannipitiya grid substation (2015 baseline: 0) 4b. +100/–50 megavolt-ampere reactive static var compensator installed in Biyagama grid substation (2015 baseline: 0)	4a–b. CEB annual report	

Key Activities with Milestones

1. Renewable energy systems established

1.1 Hybrid renewable energy systems established
1.1.1 Issue bidding documents by Q3 2016
1.1.2 Award contracts by Q3 2017
1.1.3 Start construction by Q4 2017
1.1.4 Commission by Q3 2019
1.2 Renewable energy based micro-grid pilot established
1.2.1 Complete feasibility study and detailed design by Q3 2017
1.2.2. Train LECO engineering staff in design and implementation of micro grids by Q4 2017
1.2.3 Issue bidding documents by Q1 2018
1.2.4 Award contracts by Q4 2018
1.2.5 Commission by Q1 2020
1.3 Livelihoods in local communities improved
1.3.1 Train households on (i) safe use of electrical equipment, (ii) productive use of income opportunities emerging with the electricity access, and (iii) technical skills by Q4 2017
1.3.2 Issue bidding documents for additional infrastructure by Q1 2018
1.3.3 Award contracts by Q4 2018
1.3.4 Commission by Q1 2020

2. Reliability of the medium voltage network improved

2.1 Issue bidding documents by Q3 2016
2.2 Award contracts by Q3 2017
2.3 Start construction by Q4 2017
2.4 Commission by Q3 2019

3. Rural electrification network extended and distribution performance monitoring improved

3.1 Issue bidding documents by Q4 2015
3.2 Award contracts by Q3 2016
3.3 Start construction by Q4 2016
3.4 Commission by Q3 2018
3.5 Train households on safe use of electrical equipment and technical skills to avail of employment and livelihood opportunities by Q4 2018

4. Reactive power management in the transmission system improved

4.1 Issue bidding documents by Q1 2017
4.2 Award contracts by Q1 2018
4.3 Start construction by Q2 2018
4.4 Commission by Q4 2020

Inputs

Asian Development Bank ordinary capital resources loan	$115.0 million
Government and Ceylon Electricity Board	$45.2 million
Clean Energy Fund under the Clean Energy Financing Partnership Facility	$1.8 million
Japan Fund for Poverty Reduction	$2.0 million
Total	**$164.0 million**

Assumptions for Partner Financing

Not applicable.

CEB = Ceylon Electricity Board, km = kilometer, kV = kilovolt, LECO = Lanka Electricity Company Limited, Q = quarter.
[a] Government of Sri Lanka. 2008. *National Energy Policy and Strategies of Sri Lanka*. Colombo.

Sources: Ceylon Electricity Board. 2015. *Statistical Digest 2014*. Colombo; Government of Sri Lanka. 2008. *National Energy Policy and Strategies of Sri Lanka*. Colombo; Ceylon Electricity Board estimates; Lanka Electricity Company Limited estimates; and Asian Development Bank estimates.

LIST OF LINKED DOCUMENTS

http://www.adb.org/Documents/RRPs/?id=49216-002-3

1. Loan Agreement
2. Guarantee Agreement
3. Grant Agreement (Japan Fund for Poverty Reduction)
4. Grant Agreement (Clean Energy Fund under the Clean Energy Financing Partnership Facility)
5. Project Agreement (National Water Supply and Drainage Board and Sustainable Energy Authority)
6. Project Agreement (Lanka Electricity Company Limited)
7. Sector Assessment (Summary): Energy
8. Project Administration Manual
9. Contribution to the ADB Results Framework
10. Development Coordination
11. Financial Analysis
12. Economic Analysis
13. Country Economic Indicators
14. Summary Poverty Reduction and Social Strategy
15. Gender Action Plan
16. Initial Environmental Examination
17. Resettlement Plan
18. Risk Assessment and Risk Management Plan

Supplementary Documents

19. Detailed Description of Project Components
20. Productive Energy Use for Small Isolated Island and Rural Communities
21. Project Climate Risk Assessment and Management Report