

Cover Page for Project/Program Approval Request

1. Country/Region:	Solomon Islands	2. CIF Project ID#:	(Trustee will assign ID)
3. Source of Funding:	<input type="checkbox"/> FIP	<input type="checkbox"/> PPCR	<input checked="" type="checkbox"/> SREP
4. Project/Program Title:	<i>Solar Power Development Project</i>		
5. Type of CIF Investment:	<input checked="" type="checkbox"/> Public	<input type="checkbox"/> Private	<input type="checkbox"/> Mixed
6. Funding Request in million USD equivalent:	<i>Grant: \$6.2 million</i>		<i>Non-Grant:</i>
7. Implementing MDB(s):	<i>Asian Development Bank</i>		
8. National Implementing Agency:	<i>Solomon Power</i>		
9. MDB Focal Point and Project/Program Task Team Leader (TTL):	<i>Headquarters- Focal Point: Mr. Christian Ellermann (cellermann@adb.org)</i>		<i>TTL: Mr. Anthony Maxwell (amaxwell@adb.org)</i>
10. Project/Program Description (including objectives and expected outcomes):			

This proposal refers to the ***Solar Power Development Project (“Project”)*** of the SREP Investment Plan (IP) for Solomon Islands endorsed by the SREP Subcommittee (SC) in June 2014. The proposed Project is consistent with the Asian Development Bank’s (ADB) country partnership strategy 2012-2016¹ and the country operations business plan 2016-2018². The Project supports Solomon Islands National Development Strategy 2011-2020, which prioritizes renewable energy and increasing electricity access. The Project also supports Solomon Islands Draft National Energy Policy Framework, 2013³ and the draft Solomon Islands Renewable Energy Investment Plan, 2013.⁴

The proposed Project will construct a total of 2 megawatt (MW) grid-connected solar power at five provincial grids, consisting of Kirakira, Lata, Malu’u, Munda and Tulagi. The Project will include installation of battery storage which will allow high penetration rates of intermittent solar power. These will be hybrid systems with diesel generator set (gensets) retained for back up operation when battery storage is insufficient.

The Project has two outputs:

- (i) **Five grid-connected solar power plants.** The Project will construct a total of 2MW grid-connected solar power generation at five provincial grids. Installed solar power capacity will be Kirakira (320 kilowatt [kW]), Lata (290kW), Malu’u (140kW), Munda (1,000kW) and Tulagi (250kW). The Project will include installation of battery storage which will allow high penetration rates of

¹ ADB. 2012. *Country Partnership Strategy: Solomon Islands, 2012-2016*, Manila

² ADB. 2015, *Country Operations Business Plan 2016-2018*, Manila

³ Government of Solomon Islands, Ministry of Mines, Energy and Rural Electrification. 2013. *Solomon Islands’ National Energy Policy Framework*. Honiara

⁴ Government of Solomon Islands, Ministry of Mines, Energy and Rural Electrification. 2013. *Draft Solomon Islands Renewable Energy Investment Plan*. Honiara

intermittent solar power. Battery storage sizing has been optimized and will replace between 66% and 87% of diesel generation at each of the 5 sites.⁵ The Project will include innovative technology in remote monitoring and control of the hybrid-systems.

The solar power plants will be owned and operated by Solomon Power. Solar power is modular and suitable for upscaling to meet growing demand. Project design includes oversized site layout and oversized grid connection equipment to allow for future expansion.

- (ii) **Capacity building.** An operation and maintenance training program will be implemented for Solomon Power operators in the management of small grid connected solar-diesel hybrid systems.

The Project is estimated to cost \$15.2 million. SREP funds will cover the costs of the solar power plants, including physical and price contingencies.⁶

Table 1: Proposed Financing Plan

Source	Amount (\$ million)	Share of Total (%)
Asian Development Bank		
Special Funds resources (loan)	1.0	7.0
Special Funds resources (grant)	2.0	13.0
SCF - SREP (grant)	6.2	41.0
Government	6.0	40.0
Total	15.2	100.0

The Ministry of Mines, Energy and Rural Electrification (MMERE) will be the executing agency for the project. Solomon Power will be the implementing agency. A Project Management Unit (PMU) will be established within Solomon Power to implement the project. The project will be implemented over 4 years with completion estimated by December 2020.

11. Consistency with Investment Criteria:

Increased RE capacity and increased access to energy via RE: Solomon Islands has no grid-connected solar power generation. Installed capacity in Honiara is 34 megawatt (MW), while the combined generation capacity in the provincial centers is 2.3MW. All grid-connected power generation in Solomon Islands is 100% diesel.

Electricity access is low. The country has a total population of 512,870, of which 64,609 (13% of total population) are in the capital Honiara. However, grid-connected electricity is supplied to only about 12% of the total population. Overall access rate in Honiara urban area is 64%, while access in the remainder of the country is 6%, with 5 out of 9 provinces having access rates below

⁵ Backup diesel generation will be maintained and will operate periodically during long cloudy periods and for maintenance and unplanned outages.

⁶ SREP funds will be used only for the renewable energy investments, consistent with SREP guidance. It will not be used to finance diesel generator systems or operations.

4%.

The implementation of the proposed Project will help diversify the country's energy resource mix. It will support the development of renewable energy in Solomon Islands by installing 2 MW grid connected solar power at five provincial grids, with expected generation capacity of 3.1 gigawatt-hour (GWh)⁷ annually. This will increase renewable energy share from 0% to about 78% to these provincial grids.

The primary beneficiaries of the Project are communities living in and around the five provincial outstations, including customers of the existing electricity system. An estimated 1,200 households or about 6,000 individuals (3,078 males and 2,922 females) are expected to benefit from clean energy supplies⁸.

Low-emissions development: The Solomon Islands National Development Strategy 2010-2020 identifies the need for reliable and affordable power supply to increase electricity coverage, particularly in rural areas, by promoting use of renewable energy and development of those options which are technically sound and can be made financially viable. The country, through their Intended Nationally Determined Contribution, has committed GHG emission reduction by up to 27% by 2025, and 45% by 2030 with international assistance.

The Project supports these country objectives towards low carbon development. Solomon Islands is almost completely dependent on imported petroleum for power generation as well as the transport sector. Increasing the supply of renewable energy through solar power development will help reduce carbon-intensive energy consumption.

The implementation of the proposed grid-connected solar capacity will reduce diesel importation by 0.9 million liters annually, resulting in GHG reduction of approximately 840 tons of carbon dioxide equivalent (tCO_{2e}) annually or about 16,800 tCO_{2e} over 20-year project lifetime.

Affordability and competitiveness of RE: Solomon Islands is over-reliant on imported diesel generation which has resulted in high power tariffs. The average national tariff of \$0.76/kilowatt hour (kWh) in January 2016 is amongst the highest in the Pacific. Based on 2015 Performance Benchmarking Report for Pacific Power Utilities, in 2012 the average domestic tariff across 21 Pacific utilities was \$0.45/kWh.⁹ The cost of electricity generation in the provincial grids is significantly higher than in Honiara, primarily due to high transportation costs for small volumes of diesel and low economies of scale for operation and maintenance costs. High cost of generation in the provinces provides a disincentive for Solomon Power to extend the grid to new customers, as the national tariff does not cover the cost of supply in these high cost centers. The reduction of diesel consumption will significantly simplify operation and maintenance costs of trans-shipping diesel to remote centers. The levelized cost of solar power with battery storage is \$0.405 / kWh, which compares favorably with diesel generation costs of \$0.501 / kWh.

⁷ Average solar radiation of 5.5 kWh/m²/day was used. The portion of energy produced by PV is 3.1 GWh/y and 0.9 GWh/y by diesel. The capacity factor for the PV portion is 18%, and the whole plant 22.2 %.

⁸ Based on 2009 average household size of 5.5 members and male-female population percentage of 51.3% male and 48.7% female

⁹ Pacific Power Association (2015) Performance Benchmarking Report for Pacific Power Utilities.

Conversion of provincial grids to renewable energy supports sustainable least-cost growth in provincial centers. Various alternative generation options were assessed and grid-connected solar power has been identified as the least cost generation option for the proposed sites. The country has considerable solar energy potential as it lies near the equator. The average annual solar irradiation is around 2,000 kWh per square meter (kWh/m²) at the proposed project sites, which constitutes a major renewable resource for power generation.

The five solar systems have been assessed as technically viable, and are considered as the least-cost alternatives in view of available renewable resources, necessary capital and operational costs, power output stability, and environmental impacts¹⁰. Modelling has optimized the battery storage sizing and solar integration levels based on site specific data. The system design has been carefully analyzed considering the assessed solar irradiation, load demand curve, grid conditions, harsh marine environments, and extreme weather events such as cyclones. The solar systems will include remote control, monitoring, and protection systems to stabilize the grid in line with international design standards.

Productive use of energy: The solar power project will provide sustainable, affordable, and reliable power supply to the communities. It will generate and supply electricity directly to the provincial grids improving the quality of electricity to existing commercial consumers and encouraging more business and microenterprise development.

Economic, social, and environmental development impact: The country's high cost of electricity generation and low access has been negatively impacting economic growth, particularly the commercial and tourism sectors. In rural areas, opportunities to earn cash income to meet basic non-food needs are limited. The implementation of the proposed Project will promote an enabling environment for public service provision, livelihood opportunities, and improve distribution of opportunities and services.

Economic impact: Increased solar generation will benefit the economy through reduced importation of fossil fuels and downward pressure on tariffs. Reduced fuel imports will likewise help decrease the country's trade deficit. The solar power development will stimulate domestic economic activities creating new opportunities such as access to markets, skills training, entrepreneurship, and employment. At the household level, cheaper and reliable electricity replaces expensive traditional fuels such as kerosene for lighting and use of batteries to power radios and other small appliances. This enables households to increase savings which can be used for livelihood activities.

Social impact: The Project will facilitate improved social services provisions such as hospitals and schools. Electricity at night will give more time for children to study, women to perform other productive tasks, and make public places safer with installation of streetlights. Moreover, quality supply of electricity will also allow access to modern appliances and communications.

Environmental impact: Environmental benefits will accrue primarily from the reduced use of diesel for power generation and use of kerosene for home lighting. The project will help improve

¹⁰ The feasibility design includes lead-acid batteries, however contractors will propose optimum solutions.

air quality by avoiding conventional pollutant emissions from diesel generation such as sulphur oxides (SO_x), total suspended particulate (TSP), nitrogen oxides (NO_x) and carbon dioxide (CO₂). Additionally, it will reduce the impact of diesel generator noise in the nearby communities. To ensure environmental sustainability, the project will implement an Environmental Management Plan which includes measures for the disposal/recycling of used or worn out batteries, including solar panels and other electrical equipment which will be returned to the supplier to process in a licensed facility.

Economic and financial viability: The project is financially viable with the financial internal rate of return (FIRR) estimated at 10.0%, which is higher than the (real) weighted average cost of capital (WACC) of 5.4%. The net present value is estimated at \$6.2 million. The FIRR for individual sites is Kirakira (13.1%), Lata (8.9%), Malu'u (5.4%), Munda (12.7%) and Tulagi (6.5%). A sensitivity analysis was conducted to account for potential increases in financial costs, as well as a reduction of financial benefits. The Project is robust as FIRR exceeds WACC for 20% increase in costs and 20% decrease in revenues, and for combined 20% increase in costs and 20% decrease in revenues. The project is economically feasible with the economic internal rate of return (EIRR) estimated at 17.9%, which is higher than the economic opportunity cost of capital of 12% recommended in ADB's *Guidelines for the Economic Analysis of Projects*. The EIRR for individual sites is Kirakira (20.4%), Lata (15.8%), Malu'u (13.7%), Munda (24.7%) and Tulagi (15.8%). A sensitivity analysis was conducted to account for potential increases in economic costs, as well as a reduction of economic benefits. The EIRR is robust to 20% increase in cost and 20% reduction in benefits, as well as combined 20% increase in cost and 20% reduction in benefits.

Leveraging of other financing: The SREP \$6.2 million will leverage \$3 million ADB funding (\$1 million loan and \$2 million grant), and \$6 million Government financing covering civil works, land acquisition costs, site preparation works and taxes and duties.

Gender: *please see item # 13*

Co-benefits:

Energy security: The project will help achieve energy security in the country by diversifying energy sources adding solar power to the diesel-dominated generation assets.

Employment opportunities: The project will create direct and indirect job/employment opportunities. Jobs will be available during construction, operation and maintenance of the solar power project. The capacity building component of the Project will offer long-term employment by building technical skills of local staff for solar power plant operation. Livelihood and microenterprise development will create more jobs available at the community level.

Improved health: The Project will help minimize indoor air pollution by avoiding the use of kerosene for home lighting and firewood for cooking. Among rural households, kerosene is the main source of home lighting and wood is the main source of cooking fuel.

12. Stakeholder engagement¹¹:

The Project's key stakeholders are the project steering committee; government ministries such as the MMERE and Ministry of Infrastructure Development (MID); state owned enterprises which are leasing land to the Project; government facilities such as schools, hospitals, fisheries divisions, and government administrative offices using power at outstation sites; private businesses in outstation towns (such as tourist accommodation owners, boat builders, fishing businesses, trade stores); community based organizations; and households

To facilitate stakeholder consultations and secure wider community support, a consultation and participation plan (CPP) will be undertaken at different stages of the project cycle. The CPP will detail strategies and mechanisms where stakeholders can exchange ideas and suggestions with regard to project implementation and monitoring; inform stakeholders about the project's activities, benefits, potential impacts and other relevant information; and provide feedback with regard to social and environmental impacts, mitigation measures, and other issues relating to project implementation at the sites. A series of consultations will be scheduled in each of the five outstation sites. Consultations will be done through community meetings, workshops, focus group discussions, key informant interviews, training and capacity building, participatory decision making, surveys, etc. The Project has also distributed brochures in local language as one of its strategies to inform communities and local stakeholders.

13. Gender considerations¹²:

The proposed Project is classified by ADB as Effective Gender Mainstreaming. A gender action plan has been developed based on gender analysis and community consultations, and includes specific measures related to the construction of the solar power plants. Measures included in the gender action plan cover (i) women's engagement in consultation activities, (ii) provision of gender awareness training to target groups, and (iii) actions to encourage women's participation in project-related contracts, and (v) collection of gender-related data for monitoring purposes.

14. Indicators and Targets (consistent with results framework):

Core Indicator	
(a) Installed capacity from renewable energy, as a result of SREP interventions	2 MW
(b) Annual electricity output from renewable energy as a result of SREP interventions (GWh/yr)	3.1 GWh
(c) Number of women and men, businesses and community services benefitting from improved access to electricity and fuels, as a result of SREP interventions	6,000 individuals (Male: 3,078 / Female: 2,922)

¹¹ Ibid.

¹² Ibid.

(d) GHG emissions avoided		
i. Annual		840 tCO ₂ e
ii. Lifetime (20 years)		16,800 tCO ₂ e
Development indicator(s):		
- Job opportunities during construction works, and operation and maintenance of the solar power projects		
15. Co-Financing:		
	<i>Amount (in USD million):</i>	<i>Type of contribution:</i>
• Government	\$6.0	
• MDB	\$3.0	Loan and grant
• Private Sector (please specify)		
• Bilateral		
• Others: Community		
Co-Financing Total:	\$9.0	
16. Expected Board/MDB Management¹³ approval date:		
Expected ADB board approval: September 2016		

FINAL Version
February 26, 2013

¹³ In some cases activities will not require MDB Board approval.