Climate Investment Funds

SREP/SC.11/5
May 30, 2014

Meeting of the SREP Sub-Committee
Montego Bay, Jamaica
June 27, 2014

Agenda Item 5

SREP Investment Plan for Solomon Islands

PROPOSED DECISION

The SREP Sub-Committee, having reviewed document SREP/SC.11/5, *SREP Investment Plan for Solomon Islands*:

a) endorses the investment plan as a basis for the further development of the projects and programs foreseen in the plan and takes note of the request for USD 14 million in SREP funding. The Sub-Committee requests the Government of Solomon Islands, in the further development of the proposed projects and programs, to take into account comments made at the meeting and any additional written comments submitted by Sub-Committee members by July 11, 2014, and to respond in writing to questions raised during the meeting and in subsequent written comments.

b) re-confirms its decision on the allocation of resources, adopted at its meeting in November 2010, that all allocation amounts are indicative for planning purposes and that approval of funding will be on the basis of high quality investment plans and projects.

c) approves a total of USD 1,500,000 in SREP funding as preparation grants for the following projects to be developed under the investment plan:

   i. USD 500,000 for the project entitled, *Regional Energy Access* (World Bank); and

   ii. USD 1,000,000 for the project entitled, *Solar Power Development* (ADB).

d) takes note of the estimated budget of USD 428,000 for MDB project preparation and supervision services for the project entitled, *Regional Energy Access* (World Bank) and approves USD 170,000 as a first tranche of funding for such services.

e) further takes note of the estimated budget of USD 428,000 for MDB project preparation and supervision services for the project entitled, *Solar Power Development* (ADB), and approves USD 170,000 as a first tranche of funding for such services.

MINISTRY OF MINES, ENERGY& RURAL ELECTRIFICATION
P.O.BOX G37
HONIARA
SOLOMON ISLANDS

SOLOMON ISLANDS GOVERNMENT

Phone: (677) 21522/21521 **Fax: (677)25811**

Date: 23rd May 2014
Ref: E7

Ms. Patricia Bliss-Guest
Program Manager, Administrative Unit
Climate Investment Funds,
The World Bank
Washington D. C, USA

Re: SREP INVESTMENT PLAN OF THE GOVERNMENT OF SOLOMON ISLANDS

Dear Ms. Bliss-Guest,

It is with honour to submit the Investment Plan for Scaling-up Renewable Energy in Solomon Islands to the Climate Investment Fund's SREP sub-committee for consideration. The Government of Solomon Islands highly appreciate the financial support provided by the Climate Investment Fund and the technical support from the Multilateral Development Banks (ADB and the World Bank Group in particular) to develop the SREP Investment Plan for Solomon Islands. It is hoped that the SREP sub-committee will endorse the Investment Plan to give Solomon Islands the opportunity to scale-up the use of renewable energy to reduce the cost of energy and increase access to electricity in the country.

The Government of Solomon Islands is committed to pursue sustainable economic development in line with our National Development Strategies 2011-2020. Energy is a key driver that is integral for economic growth, social development and for improvement of livelihood of communities. Solomon Islands have its own challenges and opportunities in terms of our energy situation. Our extremely low national electricity coverage, high energy costs and the high dependency on imported fossil fuel, is exacerbated by the geographical spread of the archipelagic nature of our country, which impacts on our economic and social development. Although our country is blessed with abundant renewable energy resources, it is important that the country utilises its resources wisely and minimizes any potentially detrimental effect on economic and social development.

There has been extensive consultation with all relevant government agencies, development partners and other stakeholders during the Investment Plan preparation stage and represents a critical step toward achieving the objectives of our National Development Strategies 2011-2012, National Renewable Energy Strategies 2014 and our National Infrastructure Plan

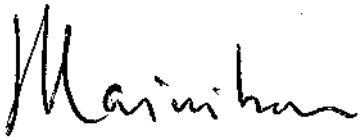
.

The Investment Plan identifies the renewable energy technologies and projects that will contribute positively to the sustainable economic development of Solomon Islands. The Plan outlines the activities that must be carried out to realize the projects and identifies the financing modalities under which the projects can be realized, and the ways in which SREP can help to leverage concessional and private sector financing.

The Investment Plan finds the SREP support can be instrumental in helping to catalyse investment in the 5 components recommended to scale-up renewable energy development in Solomon Islands. The 5 components comprise renewable energy mini-grids, grid extensions, renewable energy enabling environment, grid-connected solar power and up-scaling household solar power.

The Solomon Islands Government look forward to the support of SREP for this Investment Plan, and look forward to working with CIF and development partners to successfully implement projects and programs within each component of the Plan.

Yours Sincerely,



John Korinihona
Director, Energy Division
For: Permanent Secretary
Ministry of Mines, Energy & Rural Electrification

Government of Solomon Islands

Climate Investment Funds

SCALING-UP RENEWABLE ENERGY IN LOW-INCOME COUNTRIES (SREP)

Investment Plan for Solomon Islands

May 2014

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Abbreviations and Acronyms

AAGR	Average Annual Growth Rate
ADB	Asian Development Bank
CAGR	Compound Average Growth Rate
CNO	Coconut Oil
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IPP	Independent Power Producer
LCOE	Levellised Cost of Energy
MMERE	Ministry of Mines, Energy and Rural Electrifications
NGO	Non-Governmental Organisation
NREL	National Renewable Energy Laboratory, USA
RE	Renewable Energy
REIP	Renewable Energy Investment Plan
RESCO	Rural Electrification Service Companies
SBD	Solomon Island Dollar
SHS	Solar Home Systems
SIEA	Solomon Islands Electricity Authority
SPREP	Secretariat of the Pacific Regional Environment Programme
SREP	Scaling Up Renewable Investment Programme
USD, US$	United States Dollar

Glossary: Electrical Units

GWh	Giga-Watt-hour (10^9 watt-hour)
kV	kilovolt (10^3 volt)
kVA	kilo-Volt-Ampere (10^3 Volt-Ampere)
kW	kilo Watt (10^3 Watt)
kWh	kilo Watt-hour (10^3 Watt-hour)
MVA	Mega Volt-Ampere (10^6 Volt-Ampere)
MWh	Mega Watt-hour (10^6 Watt-hour)
MW	Mega-Watt (10^6 Watt)

1 Executive Summary

1.1 Introduction

1. This Investment Plan (IP) was prepared under the leadership of the Solomon Islands Government (SIG). The IP took into account inputs received from a wide array of stakeholders. This IP also benefited from the experiences and inputs from Asian Development Bank (ADB) and the World Bank. This IP complements the SIG's policies and programs for developing the use of renewable energy sources and thus promote a faster progression of the country along a low-carbon development path.

1.2 Country Context

2. The Solomon Islands lies in the south Pacific and consists of about 996 islands, totalling 28,450 square kilometres (km^2), dispersed over 800,000 km^2 of sea. The population of Solomon Islands is 515,870. About 80.3% of the population (75,916 households) lives in rural villages and 19.7% (15,535 households) in urban areas. From 1999 to 2009, the overall population increased rapidly at an average annual growth rate (AAGR) of 2.3% per annum. The urban population grew even more rapidly with an AAGR of 4.7%. The economy of the Solomon Islands is made up of a mixed subsistence sector on which the majority of the population is dependent, and a small monetised sector dominated by large scale commercial enterprises.

3. The *National Energy Policy Framework, 2007* sets out the broad policy directions. The National Energy Policy Framework was revised in 2013[1] and a draft is currently before Cabinet for review. The draft National Energy Policy includes a renewable energy target of 50% by 2020 (installed capacity). Implementation of the draft National Energy Policy Framework is supported by the draft Renewable Energy Investment Plan, 2013 (Draft REIP), which outlines key investments for renewable energy in the Solomon Islands. The Energy Division within the Ministry of Mines, Energy and Rural Electrification (MMERE) is responsible for energy policy, renewable energy development and project implementation. The Solomon Islands Electricity Authority (SIEA) is responsible for electric power supply and distribution to all urban and provincial centres.

4. The Solomon Islands are almost entirely dependent on imported refined petroleum fuels for national energy needs for electricity generation, for transport by land, sea and air and for lighting. The installed grid generation capacity is 28 MW and is currently 100% diesel generation. Generation capacity outside Honiara is 6.9 MW. The total energy generated in 2012 was 84 GWh of which 90% was in Honiara. In 2009, 11.8% of households in the Solomon Islands were connected to the SIEA electricity grid. An additional 0.7% of households had their own generator and 8.7% were supplied by solar, indicating a total household electrification rate of 21.2%. SIEA has a national tariff, with substantial cross-subsidies from Honiara consumers to SIEA consumers in provincial centres. In early 2013, the retail tariff was US$0.86/kWh for domestic consumers and US$0.92¢/kWh for commercial or industrial consumers.

1.3 Renewable Energy Context

5. Solomon Islands has considerable renewable energy potential. A summary of potential resources is presented below:

- **Hydropower**: Hydropower is well suited to the Solomon Islands due to the good hydrology and year round river flows. Hydropower has significant potential in Solomon Islands, both for large scale supply to the main grids and distributed supply to rural mini-grids.
- **Solar PV:** Solar irradiation is estimated at 5.5 to 6.5 kwh/m^2/day. There is significant potential for expansion of both grid-connected and distributed solar generation. Stand-alone solar and SHS also eliminates land acquisition and resettlement which is a major issue in the Solomon Islands.
- **Biomass Gasification**. Biomass gasification may be viable in Solomon islands where a waste stream is located near a suitable load center. However, due to comparatively technical complexity, there is limited potential for usage of biomass gasification.
- **Biomass Direct Combustion**. Biomass direct combustion is similarly more suited to processes where there is sufficient combustible by-product. There is limited potential for usage of direct combustion biomass power generation in Solomon Islands.

[1] Draft Solomon Islands National Energy Policy, 2013-2023, Ministry of Mines, Energy and Rural Electrification.

- **Coconut Oil**. Biofuel from coconut oil can be used in existing and new diesel generating sets. There is significant potential for expanding existing coconut oil diesel replacement trials for power generation.
- **Biodiesel**. There is potential for development of biodiesel (coconut oil based), however the high conversion costs will be a barrier in the short to medium term.
- **Geothermal**: Geothermal is a low cost, base load, renewable generation option where a suitable geothermal resource exists. As geothermal entails high upfront development costs and requires relatively high load demand, it may be suitable adjacent to the main load centre of Honiara, however may have limited application elsewhere in Solomon Islands.
- **Wind**: Based on available satellite data, the wind resource in the Solomon Islands is anticipated to be poor. MMERE are conducting an ongoing terrestrial wind measuring project which should clarify the available resource in more detail. Available levelized cost of energy for wind generation indicates that small scale wind generation is not the least cost generation option.

6. There are a number of barriers identified to the expansion of renewable energy in the Solomon Islands. These include (i) lack of standardized and streamlined approaches for land acquisition for distribution extensions and mini-grids, (ii) outdated regulatory framework which requires revision, (iii) requirement to improve system planning and project management capacity within SIEA, (iv) need to strengthen MMERE capacity to develop appropriate policies and regulations, and (v) high upfront capital costs for most renewable energy projects.

1.4 Program Description and Outputs

7. Based on the country and sector contexts, and SREP criteria, the Government in consultation with stakeholders including organisations from the private sector and civil society, have identified the following 5 priority investment components, which are proposed for SREP co-financing.

8. **Component 1 – Renewable Energy Mini-grids.** Village-level mini-grids provide a means of providing electrical energy of a quality and volume that supports income generation and opportunities in the cash-economy, that are not possible with simple household PV solar systems. There is some success in Solomon Islands over the last 20 years with local communities and Rural Electrification Service Companies (RESCOs) in developing mini-grids, most of which are based on micro-hydro technology, but with some using coconut oil biofuel and solar PV. Grid extensions and mini-grids will increase productive use of energy by allowing reliable, safe, low cost and high quality electricity for (i) productive activities during the evening, including improved education, (ii) access to communication, (iii) small retail ventures, (iv) communal freezers that can be used to preserve fish and make ice, so it can be shipped to market and generate income, and (v) handicrafts manufacturing.

9. The outcome of Component 1 is to encourage economic development and improve livelihoods in rural communities through the provision of electricity through renewable based mini-grids. The output of Component 1 will consist of installation of an estimated 60 mini-grids in rural villages utilizing hydropower, biofuel (coconut oil based) and solar photovoltaic power. Financing will utilize the Output Based Aid model and will build on existing successful work by RESCOs in Solomon Islands.

10. **Component 2 – Grid Extensions**. Component 2 would finance grid extensions to both the Honiara grid and Auki grid after their expected conversion to being predominantly supplied using renewable energy via the proposed Tina River Hydro Scheme (Honiara) and Fiu River Hydro scheme (Auki). The large displacement of fossil fueled generation on both the Honiara and Auki grids is expected to improve energy affordability, relative to the present, and contribute to further improvements in financial performance of SIEA. Financing will be undertaken through Output Based Aid (OBA), whereby a one-off subsidy payment could be made to service providers (e.g. SIEA or RESCOs) for connecting new customers to the grids.

11. The expected outcome of Component 2 will be increased household access to clean energy. The output of Component 2 will consist of connecting an estimated 3,000 households. Component 2 will include hardware and installation costs of connecting households to the low voltage grid, prepayment meter and basic household wiring.

12. **Component 3 – Renewable Energy Enabling Environment**. Strengthening both the SIEA's capacity in power system planning, and its ability to deliver capital projects across the Solomon Islands, would underpin efforts to scale up renewable energy and in meeting its statutory obligations under the Electricity Act to: (i) "promote and encourage the generation of electricity with a view to the economic development of Solomon Islands"; (ii) "to secure the cost of electricity at reasonable prices"; and (iii) "to

establish, manage and operate electric power systems". There is also a need to strengthen the capacity of MMERE to further develop the policies and regulations that govern the energy sector. The existing policy and regulatory environment limits development of renewable energy by inhibiting investment, including private investment in renewable generation. The expected outcome of component 3 will consist of establishing an improved enabling environment for upscaling of renewable energy. The outputs of component 3 will include (i) development of improved processes for land acquisition for distribution extensions and mini-grids, (ii) revised Electricity Act and Petroleum/Biofuels laws and regulations, (iii) capacity development within SIEA, and (iv) capacity development within MMERE.

13. **Component 4 – Grid-connected Solar Power**. The draft REIP identifies utility scale photovoltaic (PV) as a priority renewable energy technology that will reduce reliance on diesel generation and lower the blended cost of generation. Utility scale solar also has benefits in minimising land issues as it can be installed adjacent to existing distribution lines on leased land. There is currently no grid-connected utility scale solar PV generation in Solomon Islands and there is a need for SIEA to implement a pilot solar grid-connected project to gain experience with solar power. Increased solar generation will benefit the economy through (i) reduced importation of fossil fuels, (ii) lower cost of power generation placing downward pressure on power tariffs thereby supporting private sector and reducing household expenditure, (iii) improved energy security, and (iv) reduced tariff volatility due to partial conversion of the national grid to renewable energy. Utilization of renewable energy also reduces greenhouse gas emissions which contribute to global warming.

14. The expected outcome of Component 4 will be increased capacity of grid-connected renewable energy. The expected outputs of Component 4 will be to support the detailed design, specification, tendering, contract award, construction and commissioning a total of 2MW grid connected, utility scale PV installations. This will reduce the use of imported diesel fuel for generating electricity and help to lower the SIEA cost of generation. It will also serve as a readily replicated model for connecting PV to the grid at a commercial scale.

15. **Component 5 – Upscaling Household Solar Power.** Over the past 2 decades there have been a significant number of household systems given to households for free as part of donor projects or politically funded distribution schemes. Surveys and anecdotal evidence indicates that the majority of these systems are not maintained adequately, fail in a relatively short period, and do not deliver anticipated development impacts. The 2009 national census estimated that 21.2% of the national population had some form of household based solar systems. There is a nascent industry of equipment suppliers and system maintenance providers established in Solomon Islands, however the market is distorted by the grant nature of the current funding system. The current system is unsustainable due to (i) limited private sector involvement in the supply and maintenance of the solar home system equipment, (ii) lack of standards for solar equipment, (iii) absence of battery recycling system, (iv) lack of trained technicians for system maintenance, (v) lack of incentives for households to properly maintain equipment which was provided free of charge and expectations by households for free replacement systems, (vi) intermittent household incomes for regular maintenance payments for household solar systems, and (vii) distributed population centers and low economies of scale for service providers.

16. The expected outcome from Component 5 is increased access to energy for rural households. The expected outputs from Component 5 are trialing of a private sector led fee-for-service model to install, own, operate and maintain 2,000 household solar systems for rural households.

1.5 Financing Plan

17. The proposed project financing plan is presented below:

Summary of Financing Plan for Solomon Islands (USD $million)

		Private Sector	SREP	ADB[1.]	World Bank[1.]	Government/ SIEA	Total
Preparation of Investment Proposal			0.3				0.3
Regional Component[2.]			1.0				1.0
Renewable Energy Access Project (World Bank supported)							
1.	Renewable Energy Mini-grids	3.0	5.4	-	2.5	2.0	12.9
2.	Grid Extensions	-	-	-	3.5	3.0	6.5
3.	Project Preparation	-	0.5	-	-	-	0.5
4.	Technical assistance	-	1.0	-	1.0	-	2.0
	Subtotal	**3.0**	**6.7**	**0.0**	**7.0**	**5.0**	**21.7**
Solar Power Development Project (ADB supported)							
5.	Grid-connected solar power	-	3.8	4.5	-	1.5	9.8
6.	Household solar	1.0	1.0	1.0	-	1.0	4.0
7.	Project Preparation	-	1.0	-	-	-	1.0
8.	Technical assistance	-	1.0	1.0	-	-	2.0
	Subtotal	**1.0**	**6.7**	**6.5**	**0.0**	**2.5**	**16.7**
	Total	**4.0**	**15.0**	**6.5**	**7.0**	**7.5**	**40.3**

Source: ADB/WB/Solomon Islands Government estimates

1. Financing by ADB and WB may be provided as either loan or grant (or both) depending on Solomon Islands governments decision for utilizing country allocation of respective agencies.
2. Activities to be presented under a separate proposal

SIEA – Solomon Islands Electricity Authority, SREP – Scaling-up Renewable Energy in Low Income Countries.

1.6 Results Framework

18. The monitoring and evaluation framework is summarized below:

Monitoring and Evaluation Framework

Results	Indicators	Baseline	Targets	Means of Verification
SREP Transformative Impact				
1. Increase in renewable energy supply	% grid supplied by renewable energy	0%	50% by 2020 (national target) X% (TBD – project target)	SIEA annual report
2. Increase in access	No. households connected	0	5,000 households (grid expansion and household solar systems)	SIEA annual report
3. Increase in investments from private sector in renewable energy	USD$ invested	$0.0	$4 million	PMU Quarterly Reports
SREP Outcomes				
1. Increased supply of renewable energy	Grid-connected solar	0	TBD	SIEA annual report
	Mini-grids (MWh)	TBD	TBD	SIEA annual report
	Household solar systems (MWh)	TBD	TBD	SIEA annual report
2. Increased access to modern energy services (number of people with access to electricity)	Component 2 – grid extensions Component 1 – mini grids	TDB	15,000 (3,000 households) 30,000 (60 grids)	SIEA annual reports Project Management Unit

Results	Indicators	Baseline	Targets	Means of Verification
	Component 5 – household solar systems		10,000 (2,000 households)	Quarterly Reports
3. New and additional resources for renewable energy projects	Leveraged co-financing ($)	$0	$25 million	Project Management Unit Quarterly Reports
4. Avoided GHG emissions (tCO_2e)	Minigrids Grid-connected solar Household solar	Not applicable	TBD tCO_2e by January 2018	Project Management Unit Quarterly Reports
5. Trialing of Output Based Aid delivery mechanism	No. households connected	TBD	3,000 households (grid expansion)	SIEA annual report
	No. Minigrids put into operation	TBD	60 mini-grids	SIEA annual report
6. Capacity building undertaken for Solomon Islands Electricity Authority	Grid interconnection study		Study completed by December 2014	
	Training for SIEA technical staff on grid integration, project management capacity, power system planning and mini-grids		5 workshops February 2016 - February 2017	
7. Engage private sector for delivery of renewable energy services	Contracts established with households for fee-for-service provision of solar home systems.	0	2,000 households	PMU Quarterly Reports
8. Capacity building for MMERE	Workshops	0	5 workshops	PMU Quarterly Reports
9. Improved enabling environment for renewable energy	Revise Electricity Act	1	February 2017	PMU Quarterly Reports
	Revise Petroleum Act	1	February 2017	PMU Quarterly Reports
	Standardize land acquisition processes	1	June 2016	PMU Quarterly Reports
	Renewable energy technical standards	1	June 2016	PMU Quarterly Reports
10. Capacity building undertaken for project beneficiaries	Training workshops for newly connected households including power safety, household utility budget and business skills training		Training for all newly connected households by February 2017	

Source: ADB/WB/Government estimates
MMERE – Ministry of Mines, Energy and Rural electrification, PMU – Project Management Unit, SIEA – Solomon Islands Electricity Authority, TBD – to be determined, tCO2e – Tonnes carbon dioxide equivalent.

2 Country Context

2.1 Background

19. The Solomon Islands lies in the south Pacific and consists of about 996 islands, totalling 28,450 square kilometres (km^2), dispersed over 800,000 km^2 of sea (Figure 1). Approximately 350 islands are inhabited including the six main islands of Guadalcanal (the largest, where the capital Honiara is located), Malaita, Makira, Isabel, Choiseul and New Georgia. The population of Solomon Islands is 515,870 (November 2009). About 80.3% of the population (75,916 households)[2] lives in rural villages and 19.7% (15,535 households) in urban areas (see Table 1). About 63.5% of the 2009 urban population lived in Honiara, accounting for 12.5% of the national total. From 1999 to 2009, the overall population increased rapidly at an average annual growth rate (AAGR) of 2.3% per annum. The urban population grew even more rapidly with an AAGR of 4.7 %.

Table 1 Population of the Solomon Islands (2009)

Island or group	Population
Choiseul	26,372
Western	76,649
Isabel	26,158
Central	26,051
Rennell-Bellona	3,041
Guadalcanal*	93,613
Honiara	64,609
Malaita	137,596
Makira	40,419
Temotu	21,362

*Guadalcanal excluding Honiara

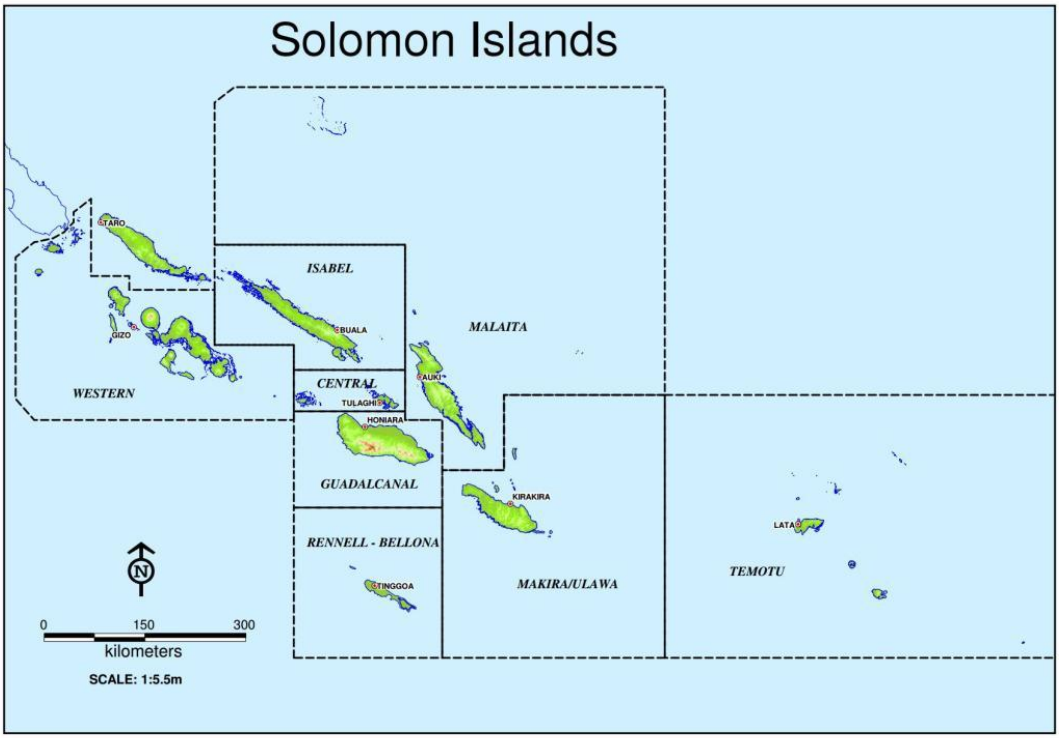
Source: Solomon Islands Government (SIG), Solomon Islands National Statistics Office. 2012. *Statistical Bulletin No 6: 2012, Basic Tables and Census Description, 2009 Population and Housing Census.* Honiara

20. The IPCC Fourth Assessment Report (2007) predicts that Least Developed Countries such as Solomon Islands will be amongst the most vulnerable to the impacts of climate change. Observations by the Solomon Islands Meteorological Services (SIMS) indicate that sea level is rising at 7mm per year or about twice the global mean value, temperature is increasing at an average rate of 0.14˚C per decade and more intense rainfall and extreme events are being experienced as predicted by regional and international scientific bodies through various climate models. Communities are already experiencing the effects of climate variability and the onset of climate change. The scattered archipelago of Solomon Islands places islands and their inhabitants at varying degrees of exposure to extreme events and their sensitivity and coping capacity are relative to the level of natural resource endowments, socio-economic situation, extent of reliance on biodiversity and other factors.[3]

[2] Statistical Bulletin 06/2011, Report on 2009 Population & Housing Census, National Statistics Office, Table P1.2

[3] National Climate Change Policy 2012 – 2017, Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM)

Figure 1 Solomon Islands



2.2 Economy

21. The economy of the Solomon Islands is made up of a mixed subsistence sector on which the majority of the population is dependent, and a small monetised sector dominated by large scale commercial enterprises. These sectors straddle both rural and urban space. Production in the mixed subsistence sector includes household production for self-consumption and surpluses for sale to local and urban markets as well as household production of cash crops for the export market. The monetised sector comprises commercial enterprises and organisations involved in primary production, manufacturing and the service industries. This includes the provision of public goods and services by the government and goods and services provided by statutory bodies.

22. The Solomon Islands dollar has performed erratically against major currencies for well over a decade with a slight appreciation in 2011. The appreciation came about as a result of a 5% revaluation of the Solomon Dollar in June 2011. Between 2007 and 2009, GDP in real (constant dollar) terms declined by 1.2% as a result of the global economic crisis. In 2011 the economy grew by 10.7% in real terms driven primarily by strong performance in commodities. The non-forestry & non-mining sectors also contributed to the overall growth, boosted primarily by activities in the agriculture, telecommunications & transportation, construction and fisheries sectors.

23. The ease of doing business in the Solomon Islands has improved significantly since the passage of the *Companies Act and the Foreign Investment Act* in 2009. The importance of overseas investment in broadening the economic base has been recognised by successive governments. The 2013 ranking by World Bank and International Finance Corporation places Solomon Islands at:

- 92nd of 185 for ease of doing business placing it 13th in the Asia Pacific region of 24 counties
- 9th of 185 for starting business, making it much easier to start a business, (apart from Samoa and Tonga) than most of the other Pacific Island Countries
- 18th of 185 for getting connected to the electricity grid, it is easy to connect to the grid in the Solomon Islands on an International basis but difficult in comparison to others in the region
- 8th of 185 for protecting investors and 15th of 185 for obtaining credit. These rankings indicate relatively high levels of investor protection.

24. Land is a complex and integral part of the Solomon Islands way of life and generally communally owned by clans or tribes. Children inherit land rights through either the father or mother depending on the lineal system practised by the particular clan. Title to land is either customary or registered. The Government recognises that all customary land is owned, usually in a lineage group; registered land has its ownership

and boundaries recorded in a land registry in Honiara and these are guaranteed by law rather than by custom. The registered system is attractive to investors, local and foreign, and allows ownership of fixed term estate in registered land. About 88% of land is customary and 12% registered. In 1977, an Amendment Bill to the Lands and Titles Ordinance converted perpetual estates registered and owned by non-Solomon Islanders and Solomon Islanders alike into 75 year fixed term estates (leases from government) with development conditions.

2.3 Energy Sector Description

2.3.1 Energy Policy

25. The National Energy Policy Framework, 2007 sets out the broad policy directions, and has two over-arching goals; (i) promote the optimal use of renewable energy technologies, and (ii) minimise negative impacts on the environment from the production, distribution and consumption of energy. It provides a basis for developing specific actions in pursuit of these principles and encourages the sector participants to adopt appropriate, indigenous cost-effective renewable energy technologies to meet energy demand in the country. The National Energy Policy Framework was revised in 2013[4] and a draft is currently before Cabinet for review. The draft National Energy Policy includes a renewable energy target of 50% by 2020 (installed capacity) and aims to:

- set development priorities and standards;
- define directions for the development of laws, regulations and procedures for guiding orderly and optimal implementation and management of renewable energy projects;
- set objectives in developing institutional capacities of Government agencies charged with the promotion of renewable energy projects;
- establish a financing framework that provides appropriate security and incentives to encourage sustainable development of renewable energy projects.

26. The draft National Energy Policy will guide the energy sector over the next ten years (2013 - 2023) and will contribute to the achievement of both the Solomon Islands Government National Vision: “A united and vibrant Solomon Islands” contained in the Solomon Islands NDS 2011 - 2020 and the vision for the energy sector, “Sustainable energy solutions and technologies”.

27. The policy will guide the activities of the Energy Division within the 10 year span and guide the development of the subsequent five (5) years energy sub-sector strategies and investment plans. It is intended that the strategies and plans under the different energy sub-sectors will be integrated into the Ministry of Mines, Energy and Rural Electrification (MMERE) 5 year Corporate Plan and annual budget round.

28. Implementation of the draft National Energy Policy Framework is supported by the draft Renewable Energy Investment Plan, 2013, which outlines key investments for renewable energy in the Solomon Islands (see Section 4).

2.3.2 Energy Legislation

29. The *Electricity Act (1969)* (Chapter 128 of the Laws of the Solomon Islands) and associated regulations provide a legal framework for the establishment of a state-owned, vertically integrated utility providing grid supply to urban and provincial centres.[5] In 1982, the Act was amended to align with utility practice at the time and allow the SIEA to expand its jurisdiction. Regulations have been promulgated which focus only on the utility functions of SIEA. Part III of the *Electricity Act* allows the SIEA to issue licences to non-utility actors to provide some electricity services. SIEA has developed distributed generation policies.

30. Fuel storage and handling are covered by the *Petroleum Act*.[6] The provisions of the *Petroleum Act* dealing with the annual relicensing of fuel storage facilities are being enforced. There is no legislation for regulation of biofuels.

31. The *Consumer Protection and Price Control Act (1995)* establishes price control rules but, of the sixteen products specifically mentioned in the Act, only petroleum products and LPG are currently systematically price controlled.

[4] Draft Solomon Islands National Energy Policy, 2013-2023, Ministry of Mines, Energy and Rural Electrification.

[5] http://www.paclii.org/sb/legis/consol_act/ea139/

[6] http://www.paclii.org/sb/legis/consol_act/pa137/

32. The *Environmental Act (1998)* commenced operation in September 2003 and its relevant regulations were gazetted in 2008. Under the Act there are formal requirements for environmental impact assessments, and requirements for energy sector investments such as power stations or oil storage.

2.3.3 Energy Division

33. The Energy Division within the MMERE is responsible for energy policy, renewable energy development and project implementation. The Director of Energy is responsible to the Permanent Secretary, appointed through the normal public service mechanism, who in turn is responsible to the Minister. The role of the Energy Division is to:

- Formulate and implement national energy policy, and monitor and evaluate its impact;
- Plan, coordinate and assist in the implementation of energy projects across the energy sector and between ministries and related agencies;
- Provide the government and energy related agencies with expert advice and analysis on energy matters;
- Act as the focal point for all petroleum matters (including price control supply, storage and distribution), and
- Act as the convener and facilitator of the national energy coordinating committee.

2.3.4 Solomon Islands Electricity Authority

34. The SIEA is responsible for electric power supply and distribution to all urban and provincial centres; i.e. Honiara, nine provincial centres, and Noro Township in the Western Province. The SIEA is a state owned enterprise, a statutory body established by an act of Parliament. Although it has been commercialised, and operates as a business with the goal of making a profit, there is a long history of under-investment, insufficient resources and under-skilled staff. The Minister of MMERE and the Minister of Finance appoint a board consisting of six members and a chair. SIEA provides power to urban centres through diesel generators, except for Buala town on Isabel Province and Malu'u substation in Malaita which includes supply by currently non-operational mini-hydro. There is considerable self generation in the Solomon Islands by institutions such as boarding schools, rural training centres, health centres, rural fisheries centres, tourist resorts, private shops and residents.

35. SIEA's financial position has improved in recent years since the 2010 net loss of SB$65,994,811. The SIEA 2012 annual report noted a year end net profit of SB$62,701,365. The high profit noted in 2008 was due to a debt forgiveness of SB$196,333,171 and a SB$14,831,088 write-off of debt balance. The revised net profit for year 2008 stood at SB$16,879,982 as recorded in the 2009 financial statement. As advised in the 2012 SIEA Annual Report the financial position of SIEA further improved in 2012 due to asset revaluations, pursuing outstanding payments, streamlining logistics and setting up more supply agreements.

2.4 Energy Supply and Demand

2.4.1 Energy Supply

36. The Solomon Islands are almost entirely dependent on imported refined petroleum fuels for national energy needs for electricity generation, for transport by land, sea and air and for lighting. The installed grid generation capacity is 28 MW and is 100% diesel. Generation capacity outside Honiara is 6.9 MW.

37. Fuel wood is used by 93% of the population as their main fuel, increasing to 97% if Honiara is ignored. Even in Honiara, more than half of households primarily use wood or wood products for cooking. A commercialised fuel wood market is well established in Honiara. Supplies come mainly from secondary forest and logged over areas of Tenaru and Mt Austin, about 10 km from Honiara. Drift wood is also used as and when available. Kerosene is the main source of home lighting and wood the main source of cooking fuel. Of the rural households in 2009, 98.7% used an open fire for cooking and 79% used kerosene or a spirit lamp for lighting. Energy consumption at the household level is summarized in Table 2.

2.4.2 Electricity

38. The total energy generated in 2012 was 84 GWh of which 90% was in Honiara. In 2009, 11.8% of households in the Solomon Islands were connected to the SIEA electricity grid. An additional 0.7% of households had their own generator and 8.7% were supplied by solar, indicating a total household electrification rate of 21.2%. In Honiara, 64% of the households are grid connected or 67% if self-generation and solar are included (Census 2009). Away from Honiara, where 90% of the population lives, 6% of households are grid connected and 16% have access to electricity if self-generation and solar are included.

Many businesses have their own generators due to frequent SIEA outages. The largest source of outages is due to lack of generation reserve, which SIEA is currently addressing through strategic investment.

Table 2 Households by Source of Electricity and Province (2009)

Island or group	Total	Elect. Main grid	Own Gen.	Solar	HH with elect.	%HH with elect.	Gas	Kero. Lamp	Coleman lamp	Wood / Coco.	Other	None
Choiseul	4,712	192	52	478	724	15.4%	19	3,869	17	2	76	5
Western	13,762	1,665	145	1,149	2,959	21.5%	10	10,425	19	88	238	23
Isabel	5,143	298	62	870	1,230	23.9%	20	3,825	16	3	47	2
Central	4,905	189	33	188	410	8.4%	7	4,476	-	-	10	2
Rennell-Belona	688	3	1	515	519	75.4%	-	145	-	-	12	12
Guadalcanal	17,163	1,411	229	597	2,237	13.0%	20	14,198	20	411	227	50
Malaita	24,421	827	74	2,969	3,870	15.8%	48	19,211	26	228	963	75
Makira	7,173	265	48	424	737	10.3%	8	5,735	74	62	471	86
Temotu	4,303	116	8	532	656	15.2%	48	19,211	26	228	963	75
Honiara	8,981	5,780	31	202	6,013	67.0%	13	2,835	36	3	60	21
National Total	**91,251**	**10,748**	**683**	**7,924**	**19,355**	**21.1%**	**147**	**68,150**	**230**	**865**	**2,223**	**281**

2.4.3 Electricity Tariff

39. SIEA has a national tariff, with substantial cross-subsidies from Honiara consumers to SIEA consumers in provincial centres. In early 2013, the retail tariff was US$0.86/kWh for domestic consumers and US$0.92¢/kWh for commercial or industrial consumers (see Table 3). There is an automatic fuel price adjustment, varying with the cost of diesel fuel. A cost of service tariff review is being conducted in 2014.

Table 3 SIEA Tariff April 2013

Category	SI$/kWh	US$/kWh
Domestic	6.1867	0.86
Commercial & Industrial	6.6465	0.92
High Voltage Tariff	6.4746	0.90
Minimum Charge ($/month)	20.00	2.79
Source: SIEA April 2013		

2.4.4 Demand Growth

40. The projected peak power demand, based on a demand growth of 3.49%, is provided in Table 4.

Table 4 SIEA Power Demand (kW Peak)

System	2012	2013	2014	2015	2016	2020	2025	2030
Honiara	14,241	14,739	15,254	15,787	16,338	18,745	22,257	26,427
Noro/Munda	410	424	439	455	470	540	641	761
Gizo	450	466	482	499	516	592	703	835
Auki	360	373	386	399	413	474	563	668
Buala	72	75	77	80	83	95	113	134
Kirakira	62	64	66	69	71	82	97	115
Lata	88	91	94	98	101	116	138	163
Malu'u	30	31	32	33	34	39	47	56
Tulagi	92	95	99	102	106	121	144	171
Total Demand	**15,805**	**16,357**	**16,929**	**17,520**	**18,133**	**20,803**	**24,701**	**29,330**
Demand Growth	3.49%							

Source: SIEA Statistics 2013 and Consultants Estimates

3 Renewable Energy Sector Context

3.1 Hydropower

41. There is substantial hydropower potential in the Solomon Islands. A Japan International Cooperation Agency study estimated the total hydroelectric potential of the Solomon Islands to be 326 MW[7]. There are ongoing assessments of a number of potential hydropower sites. A feasibility study conducted by the Solomon Islands Government — with support from the World Bank Group, European Investment Bank and the Government of Australia — has proposed a 15-20 MW hydropower development on the Tina River near Honiara, with annual electricity production exceeding 70 GWh. Final feasibility studies on the Tina River hydropower scheme were completed in March 2014. A paper is currently before cabinet seeking approval to proceed. If approval is received international interest will be sought to develop the Tina River hydropower scheme.

Box 1: Tina River Hydropower Development Project

The Tina River Hydropower Project is seeking to develop a 15-20 megawatt run-of-river hydropower scheme to supply electricity to the national capital, Honiara, using a Public Private Partnership (PPP) approach. The Government of the Solomon Islands is preparing the Tina River Hydroelectric Project with the assistance of the World Bank and the European Investment Bank (EIB). Tina Hydro is to be implemented through a private sector developer that will be selected through competitive bidding. International Finance Corporation (IFC) is Transaction Advisor to the Government for the selection of the private sector developer and execution of key project agreements such as the power purchase agreement.

The objective of undertaking the Tina Hydro project is to provide affordable power supply to the existing grid in Honiara and the surrounding region, displacing much of the energy currently supplied by the existing costly and sometimes unreliable oil-fired diesel generator units operated by the Solomon Island Electricity Authority (SIEA). The Tina Hydro project will contribute to meeting increasing electricity demand from existing industry, business and residential consumers, as well as attracting new Foreign Direct Investment (FDI).

The project would involve the construction of a 15-20 MW run-of-the-river (cascade) hydro power plant, to be implemented and operated under a concession agreement between the Government of the Solomon Islands and a private sector sponsor.

42. SIEA has recently prepared Feasibility Studies, with support by the Asian Development Bank, for 4 small-scale hydropower schemes to supply provincial centres and reduce SIEA's use of diesel-based power generation (see Table 5). Hydro power is attractive in the Solomon Islands for centralised power generation to supply the SIEA urban grids. Hydropower fed mini-grids can also be an option in rural areas depending on a suitable site and water resources.

Table 5: Small Scale Hydro Feasibility Studies

Type	Location	Estimated Capacity
Hydro, run of river	Fiu River, Auki, Malaita Province	750 kW
Hydro, run of river	Luembalele River, Lata, Temotu Province	190 kW
Hydro, run of river	Huro River, Kirakira, Makira Province	120 kW
Hydro, run of river	Mase River, Western Province	1,750 kW

43. Hydro power is attractive in the Solomon Islands for centralised power generation to supply the SIEA urban grids. Hydropower fed mini-grids can also be an option in rural areas depending on a suitable site location and water resources.

[7] JICA, Master Plan Study of Power Development in Solomon Islands, 2001, volume 1, p 5-1. A total of 130 potential hydropower sites were identified in the Solomon Islands, with a total potential of 326 MW.

44. Hydropower uses a lot of land if the catchment area, weir or dam, canal, penstock, power house and associated transmission/distribution lines are taken into account. Land acquisition and resettlement is a key issue in the Solomon's, and represents one of the most significant barriers to development of hydropower, especially for projects involving more than one group or village. Smaller hydropower constructed on a community scale is more likely to gain permission from landowners. There are a large number of micro-hydropower plants constructed in Solomon Islands to supply rural communities, as summarized in Table 6.

Table 6: Community Based Micro Hydro Plants (run-of-river)

Location	Year	Capacity	Generation	Funding	Comments
Atoifi (Adventist Hospital)	1973	30kW		Unknown	Decommissioned circa 1980
	1986	36kW		Unknown	Under repair (Oct 2010)
Iriri Settlement Kolombangara	1983	10 kW	3-4 kW	UNIDO	Not operating due to weir and penstock failures, etc (since 1997). Community is still considering whether to refurbish this system
Malu'u River (Malaita)	1986	32 kW	15 kW	NZ Aid	Not operational due to on-going land disputes
Vavanga (Kolombangara)	1994	12 kVA	8 kW	AusAID +Australian Citizens	Reconstructed on a new site with a new 8 kW turbine / genset. Commissioned June 2006. Currently operating reliably
Buala (Santa Isabel)	1996	185 kW	185 kW	GTZ	Currently not operational due to technical issues
Ghatere (Kolombangara)	1997	12 kW		AusAID + Australian Citizens	Not operating due to turbine failure, flood damage, theft of electrical equipment, etc. Community is still considering whether to refurbish this system.
Manawai (Malaita)	1997	50 kW	15-25 kW	Republic of China	Operating. Various economic and rural development spin-offs.
Bulelavata (New Georgia)	1999	29 kW	14 kW	AusAID	Has operated reliably for 7 years. Supplies power to 20 houses plus a large boarding school.
Raeao (Malaita)	2002	25 kW	14 kW	Republic of China	Operational.
Nariaoa (Malaita)	2004	25 kW		Republic of China	Completed, current operational status not known
Masupa	2010	40 kW		Solomon Islands Government	Operating (Oct 2010)

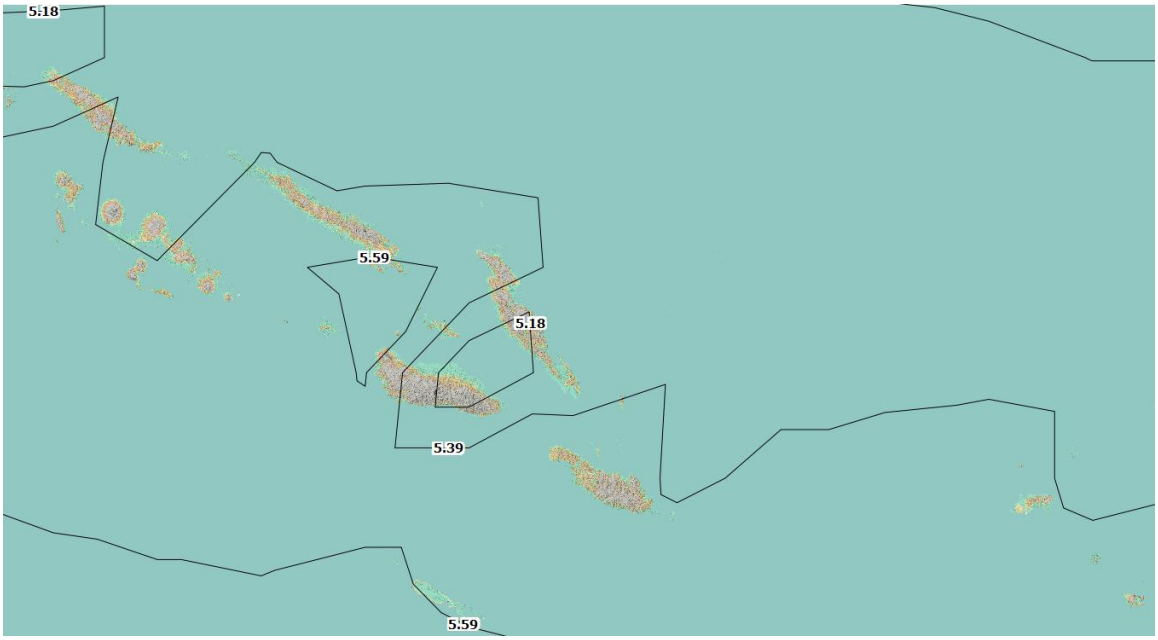
Source: Peter D. Lynch 2010, "Micro-hydroelectricity in Solomon Islands – Current Status October 2010", paper presented to Symposium on Renewable Energy Technologies, Fiji National University, Suva, 7 October 2010.

3.2 Solar

45. As the Solomon Islands lies near the equator, there is considerable solar energy potential, with insolation values of 5 kWh/m^2/day or higher which are among the highest levels in the region (see Figure 2). There is currently no grid-connected solar power generation in the Solomon Islands. A number of small-scale and demonstration projects are operational, including solar home systems (SHS) provided through Government funding since 2011, while Government of Republic of China (Taiwan) has supplied SHSs (2009) for all constituencies in the country and solar systems for rural schools. The respective Governments' of Italy & Turkey have complemented the Government of Solomon Islands project to provide solar lighting for rural-based schools including boarding schools and rural clinics. In September 2012, the Government launched a 2 year-pilot project on installation of SHSs for 2,000 households in the country that requires each household to pay the cost of installation (including transportation) and operation & maintenance costs over the 2 years period. Rural Energy Supply Companies (RESCOs) contracted by the Government will install the SHSs and

service the systems over the lifetime of the pilot phase. This project is funded under the Pacific Environmental Community Fund provided by the Government of Japan.

Figure 2 Mean Annual Direct Normal Solar Insolation Contours (kWh/m^2/day)



Source: NREL/NASA

46. There is no data on solar irradiation (direct and indirect) available in the Solomon Islands based on terrestrial measurement over an extended period of time. The NREL-NASA data has therefore been referred to as the source of solar irradiation data. Solomon Islands are endowed with good year round solar radiation resource (5.1 kWh/m^2/day to about 5.6 kWh/m^2/day direct normal annual average). This is one of the more abundant renewable energy resources available in the Solomon Islands. The main advantages solar energy has in the Solomon Islands are as follows:

- A good solar energy resource is available in almost all provinces, even in remote inland areas and can be used in stand-alone or household applications. Stand-alone and household solar will eliminate the construction of transmission and distribution lines.
- A good year round solar resource.
- During the last year the cost of solar panels have fallen by about 50% making it price competitive with fossil fuel and other renewable energy generation.

47. Constraints to development of solar power include (i) low capacity of private sector to provide maintenance services (partially due to remoteness of many communities), (ii) lead acid battery disposal, and (iii) poorly developed cash economy in some parts of the country leading to difficulties in upfront payment for household solar systems.

3.3 Biomass

48. No dedicated study has been conducted on the potential for biomass power generation in the Solomon Islands, however there are a number of readily available biomass resources. Palm oil and copra are major agricultural commodities. Traditional biomass use as cooking fuel is still relatively widespread in the un-electrified regions of the country. In the mid-1980s, copra output peaked about 40,000 tonnes, enough to produce an equivalent of 28 million litres of distillate, sufficient to displace about half of current diesel fuel imports. There are four options considered for using biomass energy to generate electricity:

- Biomass gasification using forest waste and coconut waste.
- Direct combustion using biomass waste and by-products
- Coconut oil (CNO) as a substitute for diesel fuel oil in existing diesel gensets.
- Biodiesel manufactured from CNO as a substitute (or blend) for diesel fuel oil in existing diesel gensets.

3.6.1 Biomass Gasification

49. The Solomon Islands has large palm oil plantations and coconut plantations. Waste product from these plantations could be used as a feedstock for biomass gasification for power generation. The biogas produced by the biomass gasification process can be used in dual fuel engines mixed with diesel (20% diesel and 80% biomass gas) and also alone in 100% gas engines. While biomass gasification is a mature technology in many regions of the world, there are no operating plants in the Pacific.

50. The main disadvantage of biomass gasification based power is that it is a complex process requiring additional mechanical plant as well as diesel or gas engine genset to generate electricity. Due to the difficulty and cost of transporting feedstock biomass, gasification generation is best located adjacent to processing industries which have an abundant biomass by product. Technical and financial assistance would be required for commercial development.

3.6.2 Biomass Direct Combustion

51. A direct combustion steam electric power system fuelled by biomass is for the most part indistinguishable from other steam electric power systems (for example, oil and coal) that combust fuel in a boiler to generate steam for power production. A biomass-fired boiler generates high-pressure steam by direct combustion of biomass in a boiler. There are two major types of biomass combustion boilers – pile burners utilizing stationary or traveling grate combustors and fluidized-bed combustors. Current biomass combustor designs utilize high efficiency boilers and stationary or traveling grate combustors with automatic feeders that distribute the fuel onto a grate to burn. Fluidized-bed combustors are the most advanced biomass combustors. In a fluidized-bed combustor, the biomass fuel is in a small granular form (for example, rice husk) and is mixed and burned in a hot bed of sand. Injection of air into the bed creates turbulence, which distributes and suspends the fuel while increasing the heat transfer and allowing for combustion below the temperature that normally creates nitrogen oxides (NO_x) emissions. Once again this form of biomass power generation is a complex process and relies on good operation and maintenance practices when running and maintaining the steam raising boiler and steam turbine. There are no direct combustion plants in Solomon Islands. Upfront capital costs and limited operational expertise constrain development.

3.6.3 Biomass Power – Coconut Oil Substitution

52. Most compression ignition engines will run on coconut oil (CNO). The chemical and physical characteristics of CNO vary considerably from diesel which provides challenges for trouble free operation. The use of CNO as a substitute for diesel is technically feasible but as a minimum requires water free oil filtered to 2 micron and generally fuel heating and a higher degree of operator attention. The technical feasibility of CNO use in diesel engines requires the following fuel system and engine modifications to avoid problems:[8]

- fuel heating
- blending fuel
- additional filtration
- dual fuel tanks for diesel and CNO
- fuel pump replacement
- Injector replacement
- conditioning of CNO prior to use
- additional monitoring of engine and lubrication system
- earlier replacement of filters
- earlier oil changes

53. The conclusion of a recent CNO trial in Auki noted that there are no technical issues which would stop the use of CNO in SIEA outstation generators provided the CNO used meet the required standards (see Figure 3). There is however an increased capital and operating cost associated with this. It was also noted that using CNO derived from small existing milling facilities may not financially benefit SIEA to any significant degree when compared with diesel. SIEA has recently advertised and received a number of proposals from the private sector to supply CNO to outstations for fuel blending.

[8] Final Project Workshop – ADB TA 7329 Access to Renewable Energy in the Pacific, CNO Use in SIEA Outstations, GHD,5 February 2013

Figure 3 Auki CNO Trial Processing & Storage Equipment

Source: ADB TA 7329 Access to Renewable Energy in the Pacific

3.6.4 Biomass Biodiesel

54. Biodiesel is a high-cetane fuel, which can be fully blended with fossil diesel to run compression ignition engines. It offers low emissions of GHG, sulphur compounds and particulate matter compared with fossil diesel. In current practice, a 5-20% (B5, to B20) 1st generation biodiesel (fatty acid methyl ester, FAME) is blended with fossil diesel. A full blending (up to B100) is also possible with advanced processing methods[9].

55. Commercial production of biodiesel is based on trans-esterification of vegetable oils (chemically or mechanically extracted). In the Solomon Islands this would principally be palm oil, coconut oil, animal fats and waste oil through the addition of methanol (also bio methanol or other alcohols) and catalysts, with glycerine as a by-product. Biodiesel production from animal fats and waste oils is cheaper and more efficient, but the basic feedstock is limited. There is currently no biodiesel generation in Solomon Islands.

3.4 Geothermal

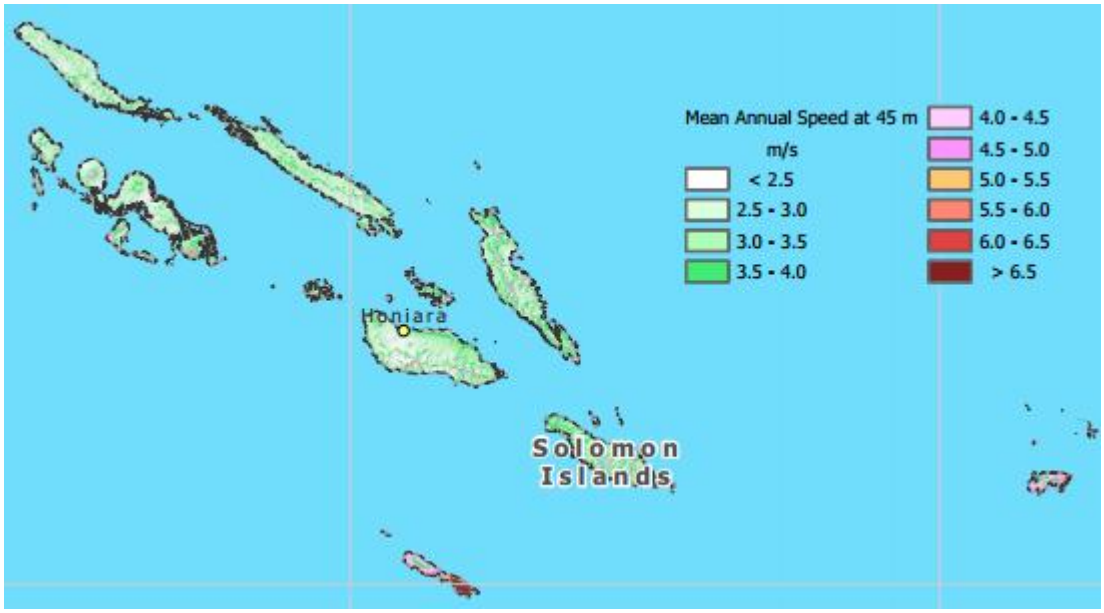
56. There are surface manifestations of geothermal energy in West Guadalcanal, the Ngokosoli river valley of Vella Lavella, Simbo Island, and Savo Island. There are no operating geothermal plants in Solomon Islands. There is an on-going pre-feasibility study for a 20 MW geothermal generation plant on Savo Island, potentially to supply the Honiara grid, which has undertaken surface geophysical surveys, however has yet to complete drilling to confirm resource availability. Geothermal is a good resource for future base load renewable generation but may be constrained by difficulties with land acquisition, transmission line routing and volcanic activity.

3.5 Wind

57. There is no known wind energy data in Solomon Islands derived directly from in country wind data logging. The NASA-NREL data derived from remote sensing, shows a poor wind regime in the Solomon Islands, with an average wind speed of about 3.5 m/sec (see Figure 4). On the basis of the NASA-NREL wind data, it is likely that wind power will have a higher levelized cost of energy than other renewable generation options presented. The variability of the wind regime together with the need to design equipment for typhoon conditions will also adversely affect the adoption of wind power in the Solomon Islands.

[9] Production of Liquid Biofuels, IEA-ETSAP and IRENA, Technology Brief P10 – January 2013, www.irena.org

Figure 4 Mean Annual Wind Speed at 45m in m/s



Source: ASTAE/WB Wind Resource Maps, Pacific Islands, 2006

58. The Pacific Islands Greenhouse Gas Abatement and Renewable Energy Programme is currently supporting the Energy Division with installation of four wind monitoring systems for the Solomon Islands. There is insufficient data to assess whether wind power is suitable for Solomon Islands, however coarse satellite analysis would indicate a poor resource. Small scale wind power projects may be used as independent stand-alone system or as a hybrid with solar. Small wind turbines are being used in places like hotels etc. in Honiara.

3.6 Barrier Analysis

3.6.1 Governance and Regulatory Institutions

59. With respect to renewable energy development, aspects of the legal, regulatory and institutional structures that need to be addressed are outlined:

- The Solomon Island Electricity Authority (SIEA) has sole authority to provide and/or supply electricity within the sovereign boundaries of Solomon Islands under the Electricity Act (1969). Any private generation must be licensed by SIEA. Although the Act provides a licensing framework for private sector participation, it is not designed for the regulation of small private off-grid electrification businesses.
- There is a lack of legislation for regulating biofuels. Private companies have been active in the Solomon Islands in the development of CNO in particular, and have been lobbying the Government to formalise a bio-fuels policy and establish a regulatory framework for the industry.

3.6.2 Size of Markets

60. The islands making up the Solomon Islands are generally small with dispersed populations. Even on the larger islands of Guadalcanal, Malaita, Isabel, Choiseul and Makira, electricity loads are widely separated and small. The small loads increase costs of generation and supply of electricity and reduce the potential to attract private sector investors.

3.6.3 Site Access and Access to Markets

61. Air and shipping services between provincial centres and outer islands are sometimes infrequent and unreliable and transportation of people, plant and materials increases costs of electricity generation and system maintenance.

3.6.4 Institutional Capacity

62. National and provincial government agencies lack the resources and training to plan, design, implement, maintain and monitor renewable energy projects. Particular barriers include:

- Private sector participation in renewable energy is still relatively new.

- There is limited cross-sectoral coordination of investment between agencies.
- There is a lack of qualified national personnel to build, operate and maintain renewable energy projects, and Government institutions have limited capacity to train and certify people for such roles. As a result, renewable energy development requires substantial high-cost external technical support for project design and supervision.

3.6.5 Ability to Pay

63. Cash income generation in rural Solomon Islands is relatively low. Most of the rural population rely on subsistence agriculture and fishing as their primary sources of income and use barter to meet many of their needs. In this environment, the ability of customers to pay for electricity in regional centres is limited.

3.6.6 Access to Commercial Financing

64. Access to commercial financing is limited in the Solomon Islands especially in rural areas. As noted in the Mid Term Review for the Sustainable Energy Financing Project[10] "*The rural poor are a big challenge as unbanked (or unreachable)"* and "*According to their figures, 85 percent of the rural population, who are in need of some power, have no regular income or access to banks*"[11]. Without a widespread cash economy in rural areas models which involve cash payments for renewable energy are more difficult to implement. The lack of access to commercial finance services is currently being partially addressed through rollout of mobile banking services.

3.6.7 Land Usage Rights

65. Land tenure is a sensitive cultural issue in the Solomon Islands and is a significant obstacle in the development of some forms of renewable energy where the energy source is located some distance from the load and on land that is owned customarily. Land usage rights and compensation may cause project delay. Models for obtaining land rights in Melanesian societies are evolving, with those emphasising a sharing of project benefits over the life of the project enjoying greater success than those relying only on up-front compensation payments.

66. Household and utility-scale solar have a defined footprint are usually located on land that is owned or alienated. Biofuel operations, too, may be located at copra plantations with resolved land usage rights. On the other hand, hydro and wind energy facilities must be sited where the energy resource occurs and this may be some distance from the load they are to serve. This means, firstly, that the sites are unlikely to be on alienated land and, secondly, that associated access roads and transmission lines, being long, linear works, may cross the land of one or more customary owners. Effective models are needed for obtaining land usage rights that will outlast a project. Benefits sharing arrangements have been put in place by Guadalcanal Plains Palm Oil Co project, with some success, and something similar is being considered for the Tina River Project.

3.6.8 Technical

67. Technical barriers to the development of renewable energy include:

- Limited import standards for renewable energy technology.
- Limited in-country experience with operation and maintenance of renewable energy technologies.
- Vandalism of equipment located in remote locations.
- Lack of laboratory facilities to test biofuel quality.
- Disposal of lead acid batteries from isolated communities.

3.7 Conclusions

68. There are a number of barriers identified to the expansion of renewable energy in the Solomon Islands. These include (i) lack of standardized and streamlined approaches for land acquisition for distribution extensions and mini-grids, (ii) outdated regulatory framework which requires revision, (iii) requirement to improve system planning and project management capacity within SIEA, (iv) need to strengthen MMERE capacity to develop appropriate policies and regulations, and (v) high upfront capital costs for most renewable energy projects. SREP financing can be used to buy down the cost of new renewable energy projects at larger scale than under current planning scenarios. The SREP-supported

[10] WB. 2011. *Mid Term Review: Sustainable Energy Financing Project*. Consultant's Report. Washington D.C.
[11] Ibid

projects will facilitate the reform agenda via a learning-by-doing approach. The renewable energy resources and potential applications are summarized below. Candidate investment projects have been screened against the SREP criteria, as summarized in Table 7.

69. **Hydropower:** Hydropower is well suited to the Solomon Islands due to the good hydrology and year round river flows. Hydropower has significant potential in Solomon Islands, both for large scale supply to the main grids and distributed supply to rural mini-grids.

70. **Solar PV:** Solar irradiation is estimated at 5.5 to 6.5 kwh/m^2/day. There is significant potential for expansion of both grid-connected and distributed solar generation. Stand-alone solar and SHS also eliminates land acquisition and resettlement which is a major issue in the Solomon Islands.

71. **Biomass**

- **Gasification.** Biomass gasification may be viable in Solomon islands where a waste stream is located near a suitable load center. However, due to comparatively technical complexity, there is limited potential for usage of biomass gasification.
- **Direct Combustion**. Biomass direct combustion is similarly more suited to processes where there is sufficient combustible by-product. There is limited potential for usage of direct combustion biomass power generation in Solomon Islands.
- **Coconut Oil**. Biofuel from coconut oil can be used in existing and new diesel generating sets. There is significant potential for expanding existing coconut oil diesel replacement trials for power generation.
- **Biodiesel**. There is potential for development of biodiesel (coconut oil based), however the high conversion costs will be a barrier in the short to medium term.

72. **Geothermal**: Geothermal is a low cost, base load, renewable generation option where a suitable geothermal resource exists. Geothermal development may be constrained by land acquisition and resettlement issues. As geothermal entails very high upfront development costs relative to other renewable energy resources, it may be suitable adjacent to the main load centre of Honiara.

73. **Wind:** Based on available satellite data, the wind resource in the Solomon Islands is anticipated to be poor. MMERE are conducting an ongoing terestial wind measuring project which should clarify the available resource in more detail. Available levelized cost of energy for wind generation indicates that small scale wind generation is not the least cost generation option.

Table 7: Selection Criteria and Shortlisting of Investment Components

SREP Criteria [a]	Grid Connected		Off-Grid		RE Enabling Environment
	Grid Extensions	Grid-based Solar	RE Mini-grids	Upscaled Solar Home Systems	
Increased installed capacity from renewable energy	**n/a**	**Moderate** 2nd largest renewable energy potential with insolation values of 5 kWh/m2/day	**Moderate** Unit capacity required is relatively low and potential is limited by the availability of hydro sites, biomass and solar power in rural communities	**Low** Large potential users in rural areas but small unit capacities required; 2nd largest RE potential with insolation values of 5 kWh/m^2/day	**High** Accelerate the adoption of RETs through improving land acquisition processes, revising Electricity Act and capacity building for MMERE
Increased access to energy through renewable energy	**High** Required to expand and improve grid-based service; Increases access but primarily limited to urban and peri-urban areas	**Moderate** Increases access but primarily limited to urban and peri-urban areas	**High** Directly increase access to hard-to-reach, dispersed small size communities; best option for current off-grid areas	**High** Directly increase access to hard-to-reach, dispersed small size communities; best option for current off-grid areas	**High** Support the development of grid extension and off-grid to unserviced areas
Low emissions development	**High** Required for renewable energy deployment in urban areas	**High** No GHG emissions; will reduce reliance on petroleum-based generation in grid-supplied areas	**Moderate** No GHG emissions for solar and hydro but full emission offset for biomass is not available; will reduce reliance on petroleum-based generation in current off-grid areas	**High** No GHG emissions; will reduce reliance on kerosene & fuelwood	**Moderate** Improved policies/law will promote use of RETs (hydro, solar, biomass, biofuels) and its quality standards
Renewable energy affordability and competitiveness	**Medium** Part of least-cost expansion in urban areas	**High** Affordable and competitive vs petroleum-based generation; cost of solar panels have decreased by about 50%	**High** Affordable and competitive vs petroleum-based generation	**High** Affordable and competitive vs petroleum-based generation; cost of solar panels have decreased by about 50%	**Moderate** Revised law will promote financing options to make RET more affordable
Productive use of energy	**High** Supports grid-connected urban residential, commercial & industrial consumers	**High** Year-round reliability with some load-following capacity; supports grid-connected urban residential, commercial and	**High** Supports majority of residential and subsistence consumers;	**High** Supports majority of residential and subsistence consumers	**High** Development of grid and off grid access will support productive end-use of energy, primarily in agriculture, rural

SREP Criteria [a]	Grid Connected		Off-Grid		RE Enabling Environment
	Grid Extensions	Grid-based Solar	RE Mini-grids	Upscaled Solar Home Systems	
		industrial consumers			enterprise, health, etc.
Economic, social, and environmental development impact	**Moderate** Serves minority of total population;	**Moderate** Serves minority of total population; design must address conflicts from land use, resettlement and environmental issues	**High** Serves majority of total population; encourage economic development and improve livelihoods and welfare in rural communities	**High** Serves majority of total population; encourage economic development and improve livelihoods and welfare in rural communities; proper battery disposal is important	**High** Use of RETs will support socio-economic development in the communities
Economic and financial viability	**High** Part of least-cost expansion in urban areas; reduces importation of fossil fuels and lowers the blended cost of generation; improves economics and financial returns from connecting new customers near existing grids	**High** Viable compared to petroleum-based generation; reduces importation of fossil fuels and lower the blended cost of generation	**High** Viable compared to petroleum-based generation; subsidies needed for affordability	**High** Viable compared to petroleum-based generation; subsidies needed for affordability	**Moderate** The law will support the use of RETs and will encourage financing options
Leverage	**Moderate** Some development partners are interested	**Moderate** Some development partners are interested	**High** Some private sector investors and development partners are interested	**High** Some private sector investors and development partners are interested	**High** The law will introduce financing options (state, private and community ownership) and a range of business models
Gender	**Moderate** Participation of women & members of excluded groups in employment opportunities	**Moderate** Participation of women & members of excluded groups in employment opportunities	**High** Directly benefits women, children and excluded groups	**High** Directly benefits women, children and excluded groups	**Moderate** Policies/regulations should ensure gender balance and benefits
Co-benefits	**Moderate** Offsets diesel and petroleum use; creation of employment and livelihood opportunities	**Moderate** Offsets diesel and petroleum use; creation of employment and livelihood opportunities	**High** Increases energy security to small rural communities; increases safety to households by eliminating the	**High** Increases energy security and safety to households by eliminating the risk of	**Moderate** Facilitates offsetting of diesel and petroleum use

SREP Criteria [a]	Grid Connected		Off-Grid		RE Enabling Environment
	Grid Extensions	Grid-based Solar	RE Mini-grids	Upscaled Solar Home Systems	
			risk of kerosene fires; reduces indoor air pollution; improves health among women and children	kerosene fires; reduces indoor air pollution; improves health among women and children	
Additional National Criteria					
Contribution to national electrification goal	**High** Supports the national renewable energy target of 50% by 2020 and national energy access target of 44% by 2020	**High** Supports the national renewable energy target of 50% by 2020 and national energy access target of 44% by 2020	**High** Supports the national renewable energy target of 50% by 2020 and national energy access target of 44% by 2020	**High** Supports the national renewable energy target of 50% by 2020 and national energy access target of 44% by 2020	**High** The policies and law will serve as blueprint for the national electrification goal
Private sector participation	**High** Reduces commercial risks for private investments	**High** Reduces commercial risks for private investments	**High** Reduces perceived risks that hinder private sector engagement	**High** Promote private sector participation through supply and maintenance of the SHS equipment	**High** Revised law will encourage private sector investments in RE through improved regulatory and energy standards
Project readiness	**Moderate** Preparation complete by year-end 2013	**Moderate** Preparation complete by mid – 2014; no experience yet on grid-connected solar power need to implement pilot project	**High** Preparation complete by mid – 2014; SIEA has prepared feasibility studies for 4 small-scale hydropower schemes.	**High** Preparation complete by mid – 2014; Government funded SHS demonstration projects are operational and can serve as replicable model	**Moderate** National Energy Policy Framework was revised in 2013[12] and a draft is currently for review at the Cabinet level

Notes: [a] The first 10 criteria are from pages 9 and 10 of *SREP Programming Modalities and Operational Guidelines*, 8 November 2010. Not all criteria apply to each proposed investment component.
Source: MDB teams

[12] Draft Solomon Islands National Energy Policy, 2013-2023, Ministry of Mines, Energy and Rural Electrification.

4 Contribution to National Energy Roadmap

4.1 National Development Strategy, 2011-2020

74. The project supports *Solomon Islands National Development Strategy 2011-2020*, prepared by the Ministry of Development Planning and Aid Coordination, which prioritizes development of reliable and affordable power supply in urban centers through renewable energy and prioritizes increasing electricity access. The strategy highlights the importance of developing renewable energy resources as a long-term strategy to provide access to affordable electricity.

4.2 National Energy Policy Framework

75. The proposed project supports Solomon Islands *National Energy Policy Framework*, 2007 and the *Draft National Energy Policy Framework, 2013*, which both prioritize development of renewable energy for urban and rural areas to reduce reliance on imported fossil fuels and increase energy security. The Framework also emphasizes the need to reduce Greenhouse Gas Emissions. The *Draft National Energy Policy Framework, 2013* has been revised based on extensive stakeholder consultation and was submitted to Cabinet for consideration in early 2014.

4.3 Draft Renewable Energy Investment Plan, 2014

76. The Solomon Islands *Draft Renewable Energy Investment Plan*, 2014 (Draft REIP) has been prepared by the MMERE with funding support from the Scaling-up Renewable Energy in low Income Countries (SREP) through the Asian Development Bank and the World Bank. The Draft REIP identifies key barriers to development of renewable energy in the Solomon Islands and identifies priority renewable energy investments, of which the proposed investments to be supported by SREP are a subset. The Draft REIP includes the following targets (i) national renewable energy target of 50% by 2020, and (ii) national energy access target of 44% by 2020.

77. All components proposed for SREP financing are included as priority activities and investments in the Draft REIP. The Draft REIP is currently undertaking final review and is anticipated to be submitted to Cabinet for consideration in mid 2014.

5 Program Description

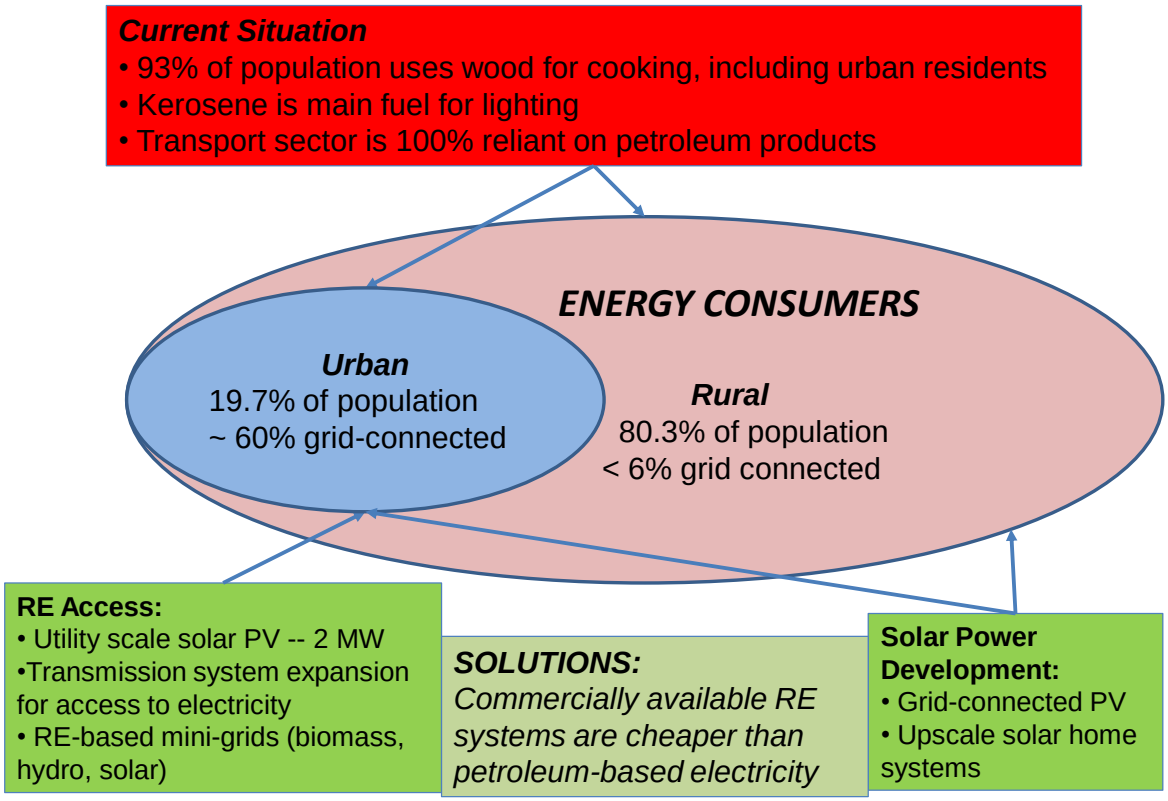
5.1 General

78. Based on the country and sector contexts, and SREP criteria[13] (see Table 7, above), the Government in consultation with stakeholders including organisations from the private sector and civil society, have identified 5 priority investment components, which will be executed via 2 projects. The following projects comprising these 5 components are proposed for SREP co-financing:

- Project 1: Renewable Energy Access (World Bank)
  - Component 1 – Renewable Energy Mini-grids;
  - Component 2 – Grid Extensions;
  - Component 3 – Renewable Energy Enabling Environment;
- Project 2: Solar Power Development (Asian Development Bank)
  - Component 4 – Grid-connected Solar Power;
  - Component 5 – Upscaling Household Solar Power.

79. The projects are depicted in the country and sector context in Figure 6 and are discussed briefly below. Additional details are presented in Annexes 4 and 5.

Figure 6: Solomon Islands Context and Proposed SREP Investments



5.2 Component 1 – Renewable Energy Mini-grids

5.2.1 Background

80. The dispersed population of Solomon Islands and low housing densities mean that many areas of the country are and will continue to be uneconomic to connect to the main power grids, based around

[13] www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/SREP_Criteria_for_Selecting_Country_and_Regional_Pilots_under_SREP_final.pdf , March 26 2010,

provincial capitals. However, village-level mini-grids associated with the governments push for "economic growth centres" in each province, do provide a means of providing electrical energy of a quality and volume that supports income generation and opportunities in the cash-economy, that are not possible with simple household PV solar systems that only displace kerosene lighting. For example, reliable power from a mini-grid allows communal freezers that can be used to preserve fish and make ice, so it can be shipped to market and generate income. There is some success in Solomon Islands over the last 20 years with local communities and RESCOs in developing mini-grids, most of which are based on micro-hydro technology, but with some using coconut oil biofuel and solar PV. Grid extensions and mini-grids will increase productive use of energy by allowing reliable, safe, low cost and high quality electricity for: (i) productive activities during the evening, including improved education; (ii) access to communication; (iii) small retail ventures; (iv) communal freezers that can be used to preserve fish and make ice, so it can be shipped to market and generate income; and (v) handicrafts manufacturing.

81. There is a distinct urban-rural division regarding access to electricity in the Solomon Islands. In the rural areas of the provinces, more than 95 percent (56,000) of rural households are without any electricity service. Those 5 per cent of rural households that do have access to electricity get it through a small number of off-grid and individual household solar and diesel systems. This low access to energy exists despite an abundance of significant potential for renewable energy resource (solar, hydro and biofuel).

5.2.2 Expected Outcomes

82. The objective of Component 1 is to encourage economic development and improve livelihoods in rural communities through the provision of electricity through renewable based renewable energy.

5.2.3 Expected Outputs

83. The output of Component 1 will consist of installation of an estimated 60 mini-grids in rural villages utilizing hydropower, biofuel (coconut oil based) and solar photovoltaic power. Financing will utilize the Output Based Aid model and will build on existing successful work by RESCOs in Solomon Islands.

5.3 Component 2 – Grid Extensions

5.3.1 Background

84. Component 2 would finance grid extensions to both the Honiara grid and Auki grid after their expected conversion to being predominantly supplied using renewable energy via the proposed Tina River Hydro Scheme (Honiara) and Fiu River Hydro scheme (Auki). The large displacement of fossil fueled generation on both the Honiara and Auki grids is expected to improve energy affordability, relative to the present, and contribute to further improvements in financial performance of SIEA. The combination of improved affordability of energy and profitability would contribute to improvements in the economics and financial returns from connecting new customers near existing grids, who are currently considered uneconomic to connect by the utility. Studies by the World Bank and SIEA have identified a range of possible grid extensions in and around the towns of Auki and Honiara — in particular peri-urban areas that do not currently have access to nearby electricity supplies. Financing will be undertaken through Output Based Aid (OBA), whereby a one-off subsidy payment could be made to service providers (e.g. SIEA or RESCOs) for connecting new customers to the grids.

5.3.2 Expected Outcomes

85. The expected outcome of Component 2 will be increased household access to clean energy.

5.3.3 Expected Outputs

86. The output of Component 2 will consist of connecting an estimated 3,000 households. Component 2 will include hardware and installation costs of connecting households to the low voltage grid, prepayment meter and basic household wiring. Note that the extension of the distribution grid will be financed by SIEA and the main internal household wiring will be financed by the residential customer.

87. The grid connection offered will be the minimum technical feasible solution and as such targeted at entry level customers, i.e. the capacity of the connection offered will be insufficient to supply commercial or industrial customers or residential customers that have large loads.

5.4 Component 3 – Renewable Energy Enabling Environment

5.4.1 Background

88. The national power utility will continue to play a key role in planning, developing, operating and maintaining energy systems across the country. SIEA is also the training ground for many electricians and engineers, some of who have gone to establish or work for RESCOs. SIEA has a role in licensing electricians and regulating electrical safety. Strengthening both the SIEA's capacity in power system planning, and its ability to deliver capital projects across the Solomon Islands, would underpin efforts to scale up RE in the country and in meeting its statutory obligations under the Electricity Act to: (i) "promote and encourage the generation of electricity with a view to the economic development of Solomon Islands"; (ii) "to secure the cost of electricity at reasonable prices"; and (iii) "to establish, manage and operate electric power systems".

89. There is a need to strengthen the capacity of MMERE to further develop the policies and regulations that govern the energy sector. The policy and regulatory environment limits development of renewable energy by inhibiting investment, including private investment in renewable generation.

5.4.2 Expected Outcomes

90. The expected outcome of component 3 will consist of establishing an improved enabling environment for upscaling of renewable energy.

5.4.3 Expected Outputs

91. The outputs of component 3 will include (i) development of improved processes for land acquisition for distribution extensions and mini-grids, (ii) revised Electricity Act and Petroleum/Biofuels laws and regulations, (iii) capacity development within SIEA, and (iv) capacity development within MMERE.

92. **Improved Land Acquisition Processes**. Component 3 will develop land holder agreements for renewable energy technologies including (i) mini/micro hydro and (ii) expansion of distribution to link renewable generation and new customers. This component will develop a schedule for successfully engaging with customary land owners to secure land and water usage rights in traditional frameworks for run-of-river mini and micro hydro. The process will cover the land acquisition issues for the hydro catchment area, headpond, weir, intake structure, canal works, penstock, powerhouse, access roads, transmission line and associated land for construction and subsequent operation. Component 3 will also develop a similar but separate land holder agreement for the installation of distribution lines for grid extension at 230/400V, 11kV and 33kV. The process will cover the land acquisition issues for overhead pole lines and underground cable circuits including locating poles, pole foundations, ground mounted and overhead distribution transformers, guy wires, earthing, excavation, reinstatement and associated access for subsequent operation and maintenance. The documentation will include detailing appropriate processes for public consultation, reaching agreement on compensation and compensation schedules and will clearly demarcate the boundaries and responsibilities for costs and maintenance between the SIEA network and the customers service drop and tariff meter. The process and subsequent compensation and agreement will comply with MDB safeguard guidelines.

93. Once these two components and associated land usage documentation have been developed, they can serve as a template for other renewable energy technologies, e.g. geothermal, biomass, wind and large hydropower. The process will include the following:

- Public consultation on appropriate land acquisition methods conducted in Honiara and in at least two other Provinces for a) mini/micro hydropower and b) SIEA grid extension;
- A short video showing the construction of a typical run of river mini/micro hydropower plant that can be used during the consultation process prior to gaining land holder agreement;
- A pro forma land holder agreement for acquiring land for run of river mini/micro hydropower plant of up to 10MW in English and Solomon Island Pidgin; and
- A short video showing the construction of a typical overhead electricity distribution line that can be used during the consultation process prior to gaining land holder agreement.

94. **Revised Electricity Act and Petroleum/Biofuels laws and regulations**. Component 3 will (i) update the Petroleum Act, and (ii) revise the Electricity Act. The revision of the Petroleum Act will address a range of matters relating to biofuels, including: storage and handling, blending with mineral fuels, and fuel quality standards. The revision of the Electricity Act will encourage grid extension and off-grid (mini-, micro-

and pico-systems) development using implementation and financing options based on state, private and community ownership using a range of business models, including:

- Utility service delivery model, in which SIEA retails electricity to consumers connected to one of its grids;
- RESCO service delivery model, in which a developer retails electricity to consumers connected to a grid extension or a mini-grid it has developed within its licence area;
- Community-based service delivery model, in which a community develops an electrification system and supplies electricity on a non-profit basis;
- Direct purchase model, in which villagers purchase pico-systems (primarily solar PV) to electrify their households.

95. **SIEA capacity development**. Component 3 will (i) assist SIEA to prepare an electricity rehabilitation and expansion plan for the SIEA grids, and (ii) provide project management training.

96. **MMERE capacity development**. Component 3 will strengthen the capacity of MMERE to develop and implement policies, laws, regulations, rules, standards and incentive schemes aimed at improving the integration and regulation of renewable energy in the energy sector. Component 3 will support a Renewable Energy Advisor to assist the Renewable Energy Unit of MMERE with the development of policy and regulations to accelerate the adoption of renewables in the Solomon Islands. SREP funding will also support attendance at regional forums and training workshops by the staff of MMERE. The Renewable Energy Adviser will support MMERE to develop technical guides for renewable connection, minimum standards for standalone and grid connected renewables and will seek government approval for the regulatory guidelines that have been prepared for connecting PV to the SIEA grid. Strengthening the institutional capacity of MMERE will improve its capabilities in the areas of policy making, planning, regulation and supervision of the sector. The component will also include development of standards for energy service companies. A better definition of responsibilities of Government Ministries, SIEA, the private sector and energy customers will contribute to more efficient operation of the sector, improving regulatory certainty and avoiding conflict of interest. Development of regulations that support renewable energy and appropriate standards, specifications and connection toolkits will enable the private sector and households to increase the rate of adoption of renewable technologies and reduce the dependence on diesel generation for electricity production. Finally, the development and adoption of standards for renewable energy technologies will increase consumer awareness and confidence in RETs as an alternative to diesel generation, reducing the perception of technical risk which can hamper access to financing.

5.5 Component 4 – Grid-connected Solar Power

5.5.1 Background

97. All grid-connected power generation in Solomon Islands is currently diesel generated, which has resulted in power tariffs amongst the highest in the Pacific. In June 2013, the national uniform tariff was $0.86/kWh to residential customers and $0.92/kWh to commercial customers. By comparison, the Pacific Power Association, Performance Benchmarking Report for Pacific Power Utilities, 2013 indicates that the average domestic tariff across 21 Pacific utilities in 2011 was $0.46/kWh. The high cost of electricity and the limited reach of the distribution grid is negatively impacting economic growth. In particular, the agricultural and tourism industry are impeded.

98. The draft REIP identifies utility scale PV as a priority renewable energy technology that will reduce reliance on diesel generation and lower the blended cost of generation. Utility scale solar also has benefits in minimising land issues as it can be installed adjacent to existing distribution lines on leased land. There is currently no grid-connected utility scale solar photovoltaic (PV) generation in Solomon Islands and there is a need for SIEA to implement a pilot solar grid-connected project to gain experience with solar power.

99. A reduction in the use of diesel fuel at the SIEA diesel generation stations in Honiara, Gizo, Buala and Tulagi, will lower SIEAs operation and maintenance costs. These installations will enable SIEA to gain experience in the installation, operation and maintenance of utility scale solar.

100. Increased solar generation will benefit the economy through (i) reduced importation of fossil fuels, (ii) lower cost of power generation placing downward pressure on power tariffs thereby supporting private sector and reducing household expenditure, (iii) improved energy security, and (iv) reduced tariff volatility due to partial conversion of the national grid to renewable energy. Utilization of renewable energy also reduces greenhouse gas emissions which contribute to global warming.

5.5.2 Expected Outcomes

101. The expected outcome of Component 4 will be increased capacity of grid-connected renewable energy.

5.5.3 Expected Outputs

102. The expected outputs of Component 4 will be to support the detailed design, specification, tendering, contract award, construction and commissioning a total of 2MW grid connected, utility scale PV installations throughout the Solomon Islands. This will reduce the use of imported diesel fuel for generating electricity and help to lower the SIEA cost of generation. It will also serve as a readily replicated model for connecting PV to the grid at a commercial scale:

(i) Installation of 1.5MW of grid connected solar PV in Honiara which will offset peak demand presently supplied by diesel generation. It will also allow for the monitoring and more detailed mapping of the solar resource in Honiara;

(ii) Installation of 0.5MW of grid connected solar PV on the provincial center outstation grids, including Gizo (400kW), Buala (50kW) and Tulagi (50kW);

(iii) Preparation of a grid integration analysis;

(iv) Training of SIEA staff in operation and maintenance of solar plants, including grid integration.

5.6 Component 5 – Upscaling Household Solar Power

5.6.1 Background

103. Electricity access is extremely low in Solomon Islands. Solomon Islands has a total population of 512,870 and the capital Honiara has a population of 64,609 (13% total population). Grid-connected electricity is supplied to approximately 12% of the population on a national basis. The overall grid connected access rate in Honiara is 64%, however access in the remainder of the country is 6%, with 5 out of 9 provinces having access rates below 4%. The main reasons for the low access rates are (i) difficult geography and dispersed small size of population centers, (ii) lack of Government community service obligation funding for grid extensions, (iii) high cost of diesel power generation in the provincial centers which provides a disincentive to the corporatized SIEA to expand the distribution network (where cost of generation exceeds national tariff), and (iv) low capacity to pay in some areas. Due to dispersed nature of the population and difficulty with physical access options for grid extension are limited.

104. Over the past 2 decades there have been a significant number of household systems given to households for free as part of donor projects or politically funded distribution schemes. Surveys and anecdotal evidence indicates that the majority of these systems are not maintained adequately, fail in a relatively short period, and do not deliver anticipated development impacts. The 2009 national census estimated that 21.2% of the national population had some form of household based solar systems. There is a nascent industry of equipment suppliers and system maintenance providers established in Solomon Islands, however the market is distorted by the grant nature of the current funding system. The current system is unsustainable due to (i) limited private sector involvement in the supply and maintenance of the solar home system equipment, (ii) lack of standards for solar equipment, (iii) absence of battery recycling system, (iv) lack of trained technicians for system maintenance, (v) lack of incentives for households to properly maintain equipment which was provided free of charge and expectations by households for free replacement systems, (vi) intermittent household incomes for regular maintenance payments for household solar systems, and (vii) distributed population centers and low economies of scale for service providers.

5.6.2 Expected Outcomes

105. The expected outcome from Component 5 is increased access to energy for rural households.

5.6.3 Expected Outputs

106. The expected outputs from Component 5 are trialing of a private sector led fee-for-service model to install, own, operate and maintain household solar systems for rural households. Component 5 will design the model, undertake private sector capacity building and partially subsidize equipment costs to connect an estimated 2,000 households. Ownership of the household solar systems will remain with the private sector and households will pay an upfront fee for service delivery to cover operation and maintenance costs and partial asset depreciation. This will assist with addressing (i) irregular income generation in rural areas, (ii)

need for regular external maintenance, and (iii) difficulties with tariff collection from remote locations. Requiring households to pay for electricity services (below current costs of kerosene) will improve ownership of the systems and address the lack of ownership observed with free systems. Component 5 will include (i) competitive bidding of partially subsidized contract for private sector to own and operate fee-for-service household solar system assets, (ii) development of national standards for solar installations, (iii) training of private sector in business management, and (iv) training of newly connected households in options for income generation through electricity, electricity safety and household budget management.

6 Financing Plan

107. Table 8 below sets out a financing plan for the investment proposals. The total project cost is $40.3 million, of which SREP financing is $15.0 million (leverage 1:2.7). SREP funds will leverage financing from Government, multilateral development banks and the private sector.

108. The financing modalities of the projects to be supported will include a combination of grant, concessional loans, and private sector equity. The modalities will be determined at the time of appraisal, in accordance with relevant SREP and MDB guidelines. This decision will take into consideration: (i) the barriers to the specific renewable energy to be supported, (ii) the country debt situation, and (iii) revenue generating prospects as well as the financial rate of return of the investment.

Table 8 Summary of Financing Plan for Solomon Islands (USD $million)

		Private Sector	SREP	ADB[1.]	World Bank[1.]	Government/ SIEA	Total
Preparation of Investment Proposal			0.3				0.3
Regional Component[2.]			1.0				1.0
Renewable Energy Access Project (World Bank supported)							
1.	Renewable Energy Mini-grids	3.0	5.4	-	2.5	2.0	12.9
2.	Grid Extensions	-	-	-	3.5	3.0	6.5
3.	Project Preparation	-	0.5	-	-	-	0.5
4.	Technical assistance	-	1.0	-	1.0	-	2.0
	Subtotal	**3.0**	**6.9**	**0.0**	**7.0**	**5.0**	**21.9**
Solar Power Development Project (Asian Development Bank supported)							
5.	Grid-connected solar power	-	3.8	4.5	-	1.5	9.8
6.	Household solar	1.0	1.0	1.0	-	1.0	4.0
7.	Project Preparation	-	1.0	-	-	-	1.0
8.	Technical assistance	-	1.0	1.0	-	-	2.0
	Subtotal	**1.0**	**6.8**	**6.5**	**0.0**	**2.5**	**16.8**
	Total	**4.0**	**15.0**	**6.5**	**7.0**	**7.5**	**40.3**

Source: ADB/WB/Solomon Islands Government estimates

1. Financing by ADB and WB may be provided as either loan or grant (or both) depending on Solomon Islands governments decision for utilizing country allocation of respective agencies.
2. Activities to be presented under a separate proposal

SIEA – Solomon Islands Electricity Authority, SREP – Scaling-up Renewable Energy in Low Income Countries.

7 Additional Development Partner Activities

109. Development partner activity in the Solomon Island power sector is summarized below (Table 9):

Table 9 Major Development Partners – Energy Sector Activities

Development Partner	Project Name	Duration	Amount ($ million)
Asian Development Bank	RETA 7329: Promoting Access to Renewable Energy	2009-2013	1.0
	Provincial Renewable Energy Development Project	2013-2020	12.0
	RETA 7394: Strengthening the Capacity of Pacific DMCs to Respond to Climate Change	2011	0.1
Australian Government	Tina River Hydropower Project – development and implementation (World Bank)	2009-2012	4.0
	Tina River Hydropower Project – Advisory Services	2009-2013	1.3
European Investment Bank	Tina River Hydropower Project	2008-2013	€0.7 million
Government of Israel	Household Solar Systems	2012	-
Government of Italy	Solar PV Systems for schools and health clinics	2008-2009	0.35
Government of Turkey	Solar PV Systems for 3 rural schools and a rural health clinic	2012	0.25
International Finance Corporation	Tina River Hydropower Project	2009-2013	1.3
International Union for the Conservation of Nature (IUCN)	Home solar PV systems, Malaita	2012	-
	750W solar PV System - Tetepare	2012	-
Japan International Cooperation Agency	Pacific Environment Community (PEC) Fund - Carbon Abatement via Solar Home Systems in Rural Areas	2012-2015	4.0
World Bank	Sustainable Energy Financing Project (SEFP)	2009-2013	<1.0
	Solomon Islands Sustainable Energy Project (SISEP)	2009-2014	4.0
	Tina River Hydropower Project	2008-2013	4.0
United Nations Development Programme (UNDP)	Wind resource monitoring	2012-2013	0.09
	Solar PV - ICT equipment in 10 locations in provincial centres and substations	2013-2014	0.35

'-' funding allocation uncertain
Source: Asian Development Bank

8 Implementation Potential with Risk Assessment

8.1 Implementation Potential

110. The Solomon Islands Government is committed to scaling-up renewable energy in the Solomon Islands and is ready to implement the projects to be supported by SREP. MMERE will have overall responsibility for implementation of the project, while both MMERE and SIEA will act as implementing agencies for relevant components. A Project Steering Committee will be established to oversee project implementation. The organizational arrangements for the project will be as follows:

- Overall Responsible Agency: Ministry of Mines, Energy and Rural Electrification (MMERE)
- Focal Point Persons: (i) Director, Energy Division, MMERE; and (ii) General Manager, SIEA
- Implementing Agencies for the Projects:

	Component Name	Implementing Agency
1.	Renewable Energy Mini-grids	MMERE
2.	Grid Extensions	SIEA
3.	Renewable Energy Enabling Environment	MMERE
4.	Grid-connected Solar Power	SIEA
5.	Upscaling Household Solar Power	MMERE

MMERE – Ministry of Mines, Energy and Rural Electrification, SIEA – Solomon Islands Electricity Authority

- Project Steering Committee:
    - Ministry Mines, Energy and Rural Electrification.
    - Ministry of Finance and Treasury.
    - Ministry of Rural Development.
    - Ministry of Development and Aid Coordination (MDAC).
    - Ministry of Infrastructure and Development (MID).
    - Solomon Islands Electricity Authority.
    - Private sector representative.

8.2 Risk Assessment

111. The overall implementation risk is assessed as low to medium after planned risk mitigation measures are applied. Table 10 summarizes the following table reviews the institutional, technology, environmental, social and financial risks involved.

Table 10 Risk Assessment of the SREP Investment Plan for the Solomon Islands

Risk	Description/Mitigation	Residual Risk
Institutional Risks (risks related to policy and regulatory environment and/or institutional capacity)	The policy and regulatory environment is currently undergoing revision. The Solomon Islands Government has recently drafted an updated National Energy Policy Framework and drafted a Renewable Energy Investment Plan. These documents form a robust assessment of priority RE investments. All proposed SREP-supported investments are identified as key investments in these documents. Component 3 includes revision of the Electricity Act and Regulations. Lack of institutional capacity to implement the draft National Energy Policy Framework and draft Renewable Energy Renewable Energy Investment Plan is a risk. This risk is mitigated by capacity building support provided to both MMERE and SIEA by the proposed SREP components.	Low
Environmental (risks related to environmental impacts)	All activities will comply with requirements of the Environment Act 1998 and the Environment Regulations 2008 which require development consent for prescribed activities to be obtained from the Ministry of Environment, Climate Change and Disaster Management (MECDM). A development consent application must include an	Low

	environmental assessment which complies with Environment Act and Environment Regulations requirements. The Project will also comply with the requirements of ADB and World Bank environmental safeguards, depending on the lead agency for the respective projects. An environmental impact assessment will be undertaken for all components, including preparation of an Environmental Management Plan (EMP) which will contain mitigation measures, environmental monitoring, and capacity development requirements covering the pre-construction, construction and operational phases. The EMP will form part of the construction contract documents and the contractor will be required to prepare a site-specific environmental management plan (SEMP) based on the contract EMP. The proposed activities are anticipated to have a relatively low environmental impact (grid extensions with urban settings, village mini-grids, solar PV installations at existing sites, household solar systems), however this will be assessed in detail during the environmental impact assessment. The operation of the Project should have overall beneficial effects on the environment through more efficient provision of electrical power from renewable resources and improved environmental management within MMERE and SIEA.	
Social (risks related to social issues)	The components will be assessed for social safeguard impacts during project preparation, in accordance with ADB and World Bank safeguard guidelines (depending on the relevant lead agency). This will include assessments for resettlement (including land acquisition requirements) and indigenous peoples. The assessment will include a plan to address social safeguard issues. Land acquisition is a significant barrier to infrastructure development in the Solomon Islands. Component 3 includes development of a standardized approach to addressing land acquisition for power sector infrastructure assets. Components have specifically been selected to minimize land acquisition issues. No physical relocation or loss of income is expected from the implementation of the project (to be confirmed during project preparation) as the components will be constructed either along existing road corridors, or within communal community owned land. The project will provide capacity building support to strengthen MMERE and SIEA's social safeguard capacity.	Medium
Financial (risks related to the financial viability of the sector or entities)	Component 1 (renewable energy mini-grids) and Component 5 (upscaling household solar power) will be designed to ensure financially sustainable models are utilized. Component 2 (grid extensions) is unlikely to be financially viable as a standalone project, however is justified on the economic and social benefits from increased energy access.	Low
Technological (risks associated with technological complexity)	The anticipated technological risk is assessed as low as the proposed technology is robust, proven technology with well established supply chains. Component 1: There are a number of existing mini-grids currently operating in Solomon Islands. The technology is generally proven and well understood. Local training will be required to ensure local-based capacity for operation and maintenance. Component 2: Distribution technologies are well proven and Solomon Islands has significant experience in managing similar technology. Component 4: While there is no utility scale grid-connected solar in the Solomon Islands, there are numerous similar installations in the Pacific region and the technology is proven in similar conditions. Component 5. Solomon islands has extensive experience with household solar systems. The main feature of Component 5 will be implementation of a private-sector led model which has been tried previously in Solomon Islands.	Medium
Execution (risks related to implementation capacity)	MMERE will be implementing agency for three components. The project will provide design technical support and capacity building to MMERE to ensure the components are designed and implemented efficiently and sustainable systems are established for the operation and maintenance period. SIEA will be implementing agency for three components. A capacity assessment of SIEA will be conducted during project preparation, including procurement capacity assessment, financial management capacity assessment and technical capacity assessment. Component 3 includes capacity building activities for SIEA. The project will include additional capacity building activities, as recommended during the project design.	Medium

9 Monitoring and Evaluation

112. The project will define and implement a Monitoring and Evaluation (M&E) system aimed at collecting, analyzing, processing and communicating key information related to project activities, as well as results, impacts and lessons learnt. The M&E framework will be managed and reported by the Project Management Unit, which will be implementing the project. The monitoring and evaluation plan for the project is summarized in Table 11:

Table 11 Monitoring and Evaluation Framework

Results	Indicators	Baseline	Targets	Means of Verification
SREP Transformative Impact				
1. Increase in renewable energy supply	% grid supplied by renewable energy	0%	50% by 2020 (national target) X% (TBD – project target)	SIEA annual report
2. Increase in access	No. households connected	0	5,000 households (grid expansion and household solar systems)	SIEA annual report
3. Increase in investments from private sector in renewable energy	USD$ invested	$0.0	$4 million	PMU Quarterly Reports
SREP Outcomes				
1. Increased supply of renewable energy	Grid-connected solar	0	TBD	SIEA annual report
	Mini-grids (MWh)	TBD	TBD	SIEA annual report
	Household solar systems (MWh)	TBD	TBD	SIEA annual report
2. Increased access to modern energy services (number of people with access to electricity)	Component 2 – grid extensions Component 1 – mini grids Component 5 – household solar systems	TDB	15,000 (3,000 households) 30,000 (60 grids) 10,000 (2,000 households)	SIEA annual reports Project Management Unit Quarterly Reports
3. New and additional resources for renewable energy projects	Leveraged co-financing ($)	$0	$25 million	Project Management Unit Quarterly Reports
4. Avoided GHG emissions (tCO_2e)	Minigrids Grid-connected solar Household solar	Not applicable	TBD tCO_2e by January 2018	Project Management Unit Quarterly Reports
5. Trialing of Output Based Aid delivery mechanism	No. households connected	TBD	3,000 households (grid expansion)	SIEA annual report
	No. Minigrids put into operation	TBD	60 mini-grids	SIEA annual report
6. Capacity building undertaken for Solomon Islands Electricity Authority	Grid interconnection study		Study completed by December 2014	
	Training for SIEA technical staff on grid integration, project management capacity, power system planning and mini-grids		5 workshops February 2016 - February 2017	
7. Engage private sector for delivery of renewable	Contracts established with households for	0	2,000 households	PMU Quarterly Reports

Results	Indicators	Baseline	Targets	Means of Verification
energy services	fee-for-service provision of solar home systems.			
8. Capacity building for MMERE	Workshops	0	5 workshops	PMU Quarterly Reports
9. Improved enabling environment for renewable energy	Revise Electricity Act	1	February 2017	PMU Quarterly Reports
	Revise Petroleum Act	1	February 2017	PMU Quarterly Reports
	Standardize land acquisition processes	1	June 2016	PMU Quarterly Reports
	Renewable energy technical standards	1	June 2016	PMU Quarterly Reports
10. Capacity building undertaken for project beneficiaries	Training workshops for newly connected households including power safety, household utility budget and business skills training		Training for all newly connected households by February 2017	

Source: ADB/WB/Government estimates
MMERE – Ministry of Mines, Energy and Rural electrification, PMU – Project Management Unit, SIEA – Solomon Islands Electricity Authority, TBD – to be determined, tCO2e – Tonnes carbon dioxide equivalent.

Annex 1: Assessment of country's absorptive capacity

Debt Sustainability

1. In 2010, the joint IMF-World Bank Debt Sustainability Analysis (DSA) upgraded the country's status from high to moderate risk of debt distress. A follow up DSA in December 2012 reaffirmed the rating of moderate risk of debt distress. The Solomon Islands government has adopted a debt management strategy in May 2012 that allowed the resumption of public borrowing after a public borrowing freeze mandated by the Honiara Club Agreement in 2005.

2. The Government has considerable head room to increase borrowing but has so far adopted a measured approach to increasing its use of concessional loans. The government has set a ceiling for public debt at 30% of GDP. At the end of June 2013, this was equivalent to 11.0% of GDP. Contingent liabilities are also low at the equivalent to 0.8% of GDP. The government's debt management capacity was favorably reviewed by a Core Economic Working Group Joint Review Mission (JRM) in 2013. The JRM noted that debt management is conservative and under control. There is stress testing of the portfolio by the Economic Reform Unit and the Debt Management Unit and the JRM noted the innate conservatism in the management of debt (and of cash-flow management) due to the uncertainty of Government commitments and spending patterns. The JRM welcomed the recent establishment of the Debt Management Advisory Committee, under which new borrowing proposals are scrutinized against a conservative borrowing ceiling.

Implementing Agency Capacity

3. MMERE will be implementing agency for Component 1: Renewable Energy Mini-grids, Component 3: Capacity Building, and Component 5: Upscaling Household Solar Power. MMERE has significant experience with implementation of development partner funded projects. The project will provide design technical support and capacity building to MMERE to ensure the components are designed and implemented efficiently and sustainable systems are established for the operation and maintenance period.

4. SIEA will be implementing agency for Component 2: Grid Extensions, and Component 4: Grid-connected Solar Power. A recently completed[14] procurement capacity assessment of SIEA has indicated that SIEA has an established procurement unit with considerable procurement experience; however the experience is largely related to procurement of small equipment packages. SIEA also has limited experience in managing larger contract packages or ADB/World Bank procurement systems. A financial management assessment was also completed for SIEA where inefficiencies were noted in areas including internal control. A capacity assessment for SIEA will be undertaken during project preparation and will include management capacity assessment, procurement capacity assessment, and financial management assessment. Based on the analysis, risk mitigation will be designed into the project to address capacity concerns, and may include (i) capacity building training for SIEA staff, (ii) provision of international experts to assist with key functions related to project design and implementation, and (iii) procurement options such as long term maintenance contracts, operation and maintenance contracts, and engineer, procure and construct (EPC) procurement.

[14] ADB. 2012. *Technical Assistance to the Solomon Islands for Preparation of the Outer Island Renewable Energy Project.* Manila.

Annex 2: Stakeholder Consultations

Stakeholder Consultation Process

1. Firstly, SREP technical assistance supported development of the draft National Renewable Energy Investment Plan (draft REIP), which included broad consultations by the consultants to identify priority renewable energy investments. Secondly, 3 consultation missions were held to discuss the proposed investment plan with key stakeholders. Thirdly, a joint programming mission was held on 19-23 August 2013 to each agreement with the Government on the content of the investment plan. Fourthly, the draft Investment Proposal was finalized and uploaded for public consultation.

Draft Renewable Energy Investment Plan

2. Broad consultation was undertaken with key stakeholders between April 2013 and August 2013 by technical consultants during the preparation of the draft REIP. Consultation included targeted one-on-one consultations with key stakeholders including (i) Ministry of Finance and Treasury, (ii) MMERE, (iii) Solomon Islands Electricity Authority, (iv) development partners (New Zealand, Australia, Japan, European Union), (xi) private sector, and (xii) non-government organizations. The proposed investment plan was drafted based on initial feedback from key stakeholders.

Background Missions

3. Consultation missions were held on (i) 4-15 February 2013, (ii) 6-10 May 2013, and (iii) 17-28 June 2013. The consultation missions were to oversee progress on the preparation of the draft REIP and to hold ongoing consultation with key stakeholders regarding priority components for the investment plan. Consultations were held with (i) Ministry of Finance and Treasury, (ii) MMERE, (iii) Ministry of Planning and Aid Coordination, (iv) Ministry of Rural Development, (v) Solomon Islands Electricity Authority, (vi) New Zealand High Commission, (vii) Australian High Commission, (viii) European Union, (ix) Government of Japan, (x) Provincial Governments (Western Province and Malaita), (xi) private sector, and (xii) non-government organizations. Feedback received during the consultation missions was used to refine the investment plan proposals.

Joint Programming Mission

4. A joint programming mission visited the Solomon Islands from 19-23 August 2013 to conduct a programming mission for the proposed SREP support. The mission included representatives from ADB, World Bank, MMERE and SIEA. The main objective of the mission was to finalize the Investment Plan for the proposed activities to be supported by SREP. The mission held consultations with a range of stakeholders including (i) Ministry of Finance and Treasury, (ii) Ministry of Planning and Aid Coordination, (iii) Australia High Commission, (iv) New Zealand High Commission, (v) Government of Japan, and (vi) private sector. The mission held a series of technical meetings with proposed implementing agencies (SIEA and MMERE) and held a stakeholder consultation workshop on 21 August 2013 to discuss the proposed investment plan with key stakeholders. The consultation workshop was attended by over 20 key stakeholders, including (i) MMERE, (ii) SIEA Board members, (iii) International Finance Corporation (IFC), (iv) private sector, (v) Australian Government, and (vi) Tina River Hydropower Project Office. The mission reached agreement with the main stakeholders on the proposed components for the SREP supported investment.

Public Consultations

5. The draft Investment Plan was circulated for final comment to key stakeholders in November 2013. Final comments were received and incorporated. The draft Investment Plan was then uploaded onto the MMERE website for public disclosure. Comments received were subsequently incorporated.

Annex 3: Co Benefits

1. Grid-connected Solar Power (Component 4). Increased availability of renewable energy generates a number of development co-benefits, including the following:

- Downward pressure on affordability of electricity.
- Improved balance of payments due to reduced fossil-fuel imports and reduced outflow of foreign reserves.
- Reduced carbon emissions through replacement of diesel generation with renewable generation.
- Employment opportunities during project construction stage.
- Improved energy security.
- Capacity building within MMERE and SIEA.

2. Mini-grids (Component 1), Grid Extensions (Component 2), and Upscaling Household Solar Power (Component 5). Improved energy access generates a number of development co-benefits in the communities where the projects take place, including the following:

- Improved education outcomes due to extended hours for school study.
- Improved access to communication services.
- Better health services due to lighting in clinics and improved ability to store vaccines.
- Improved education services through provision of lighting and communication services to schools .
- New community activities through improved communication services.
- Improved security due to increased availability of public lighting.
- Increased economic activity due to ability for households and small businesses to generate additional income through value-adding, particularly for agri-business.
- Increased household income through reduced expenditure on kerosene.
- Reduced threat of household fire's from toppled kerosene lamps.
- Employment opportunities during project construction stage.
- Increased empowerment of women who receive proportionally higher benefits from increased access to energy.

Annex 4: Project Concept 1: Renewable Energy Access

A. PROBLEM STATEMENT

1. Solomon Islands faces complex development challenges stemming largely from its small, sparsely distributed population, its remoteness and limited connectivity to internal and external markets, and political instability. Solomon Islands is a fragile, post-conflict, country with thin technical capacity in the areas of power system planning, energy sector regulation, and engineering. The population of Solomon Islands (515,870 according to the 2009 census) is spread over 300 islands, with 80% of the population living in rural communities that are geographically isolated from each other. There are few roads on most of the islands, limited commercial shipping between islands, and air transportation is unaffordable for most citizens.

2. **Low access and high costs of energy**. In Solomon Islands, the cost of electricity is high (US$0.85/kWh for households and US$0.91/kWh for commercial customers), and access to electricity is low due to: a) the limited coverage of the existing power network; b) dispersed population across an island archipelago; and c) heavy reliance on imported petroleum fuels for power generation. According to the 2009 Census of Solomon Islands, 79 percent of households are without access to any electrical supply. Grid-based electricity supplies approximately 12% of the national population but is confined to the capital city and largest electrical load center, Honiara, and nine provincial centers.[15] The ten grids are operated by- the state-owned power utility, the Solomon Islands Electricity Authority (SIEA), and the reach of them has not expanded dramatically since 1978, when Solomon Islands became independent. In Honiara, 67 percent of households have access to electricity, with 96 percent of these households having access via the SIEA's distribution grids. But in the provinces taken as a whole, access to any electricity supply is only 16 percent, with 6 percent being connected via traditional power grids serving the small provincial capitals, 9 percent from solar PV systems and around 1 percent from individually owned petrol or diesel generators. At a provincial level, the electricity access rate for grid power is highest in Western Province 12.1%, but access rates in the remaining provinces are extremely low; for example, Malaita 3%, Temotu 3%, Choiseul 2%.

3. There is a distinct urban-rural division regarding access to electricity. In the rural areas of the provinces, more than 95 percent (56,000) of rural households are without any electricity service. Those 5 per cent of rural households that do have access to electricity get it through a small number of off-grid and individual household solar and diesel systems. This low access to energy exists despite an abundance of significant potential for renewable energy resource (solar, hydro, biofuel and recently geothermal).

4. Geographic, commercial, regulatory, political and institutional factors have all contributed to the low access rates, including: (i) difficult geography and dispersed small size of population centers; (ii) lack of Government community service obligation funding for grid extensions; (iii) high cost of diesel power generation in the provincial centers which provides a disincentive to the corporatized SIEA to expand the distribution network (where cost of generation exceeds national tariff); and (iv) low capacity to pay in some areas.

5. **Limited Technical Capacity**. Following a long period of financial difficulties — from which it has now emerged — the national power utility has very limited technical capacity in the areas of power system planning and in effectively managing a broad range of capital investment projects across the archipelago of Solomon Islands. In the period since August 2011 to August 2013, the SIEA has turned around from being close to insolvent to having a strong balance sheet, an unqualified audit for 2012, and being profitable. The SIEA has accumulated significant retained earnings over the last 2 years that it is now seeking to invest in long-overdue capital investments to improve the reliability, efficiency and affordability of electricity supply.

6. **Legal and Regulatory Framework.** There are shortcomings in the Solomon Islands' existing legal and regulatory arrangements governing the energy sector that adversely affect the scaling up of renewable energy. These include: a) Convoluted and lengthy processes around landowner identification and land acquisition that slow or prevent distribution grid extensions and the development of mini-grids; b) A dated *Electricity Act* and regulations, which provide little guidance on the role that private sector Rural Energy Service Companies (RESCOs) and community owned energy companies could play in increasing access to energy services; c) Biofuels are not covered in the outdated *Petroleum Act*, despite coconut oil being a potentially large source of renewable energy that could substitute for mineral diesel in Solomon Islands.

[15] Auki, Buala, Gizo, Kirakira, Lata, Maluu, Munda, Noro, Tulagi.

B. PROJECT OBJECTIVE

7. The objective of the project is to support the increased penetration of renewable energy and increased access to energy in Solomon Islands. The project will seek to do achieve this objective by co-financing:

(i) the development of mini-grids, which will support the economic development of villages or small town centres by providing reliable, affordable energy sufficient to support a range of agriculture and fisheries based business, and other small scale businesses. An Output Based Aid (OBA) approach is proposed for these grid extensions and mini-grids;

(ii) extensions to power grids that are predominantly supplied by renewable energy (e.g. Honiara and Auki after major renewable energy projects are commissioned);

(iii) technical Assistance, in three specific areas, to improve the enabling environment for scaling up renewable energy:

a. Standardized and streamlined approaches for land acquisition for distribution extensions and small mini-grids;

b. Amendments to the *Electricity Act* and Petroleum/Biofuels laws and regulations; and

c. Improving the SIEA's power system planning and project management capacity.

8. **Component 1 — Mini-grids.** Component 1 would finance new rural mini-grids, using an OBA model and building on the existing successful work by RESCOs in Solomon Islands. Component 1 will focus on supporting development of the community based model, engaging private sector for part ownership and operation and maintenance where feasible on a case by case basis. The dispersed population of Solomon Islands and low housing densities mean that many areas of the country are and will continue to be uneconomic to connect to the main power grids, based around provincial capitals. However, village-level mini-grids or associated with the governments push for "economic growth centres" in each province, do provide a means of providing electrical energy of a quality and volume that supports income generation and opportunities in the cash-economy, that are not possible with simple household PV solar systems that only displace kerosene lighting. For example, reliable power from a mini-grid allows communal freezers that can be used to preserve fish and make ice, so it can be shipped to market and generate income. There is some success in Solomon Islands over the last 20 years with local communities and RESCOs in developing mini-grids, most of which are based on micro-hydro technology, but others using coconut oil biofuel and solar PV technology.

9. When surveyed in late 2010, six out of the seven community-owned micro-hydro schemes in Solomon Islands built remain operational. The relative success of the community based micro-hydro schemes appears to be due to six features:

- a strong sense of community ownership in the schemes and the benefits they provide in terms of energy services and income generation;
- the fact that electricity prices for these schemes are set outside the National Uniform Tariff, taking into account the long run costs of the scheme and capacity of the community to pay;
- the schemes have been effectively operated and maintained by trained local technicians familiar with micro-hydro and the specifics of each scheme;
- most schemes are run along commercial lines, with adequate provision for O&M, depreciation, and the purchase of spare parts, and a return on investment;
- the mechanical and electrical equipment and controllers are simple, robust and readily repaired in remote locations; and
- technical support and spare parts for the schemes are available within Solomon Islands through a local privately owned, for-profit RESCO that is backed up by the original equipment manufacturer.

10. At least two other RESCOs in Solomon Islands — Willies Electrical and Solomon Tropical Products — have established mini-grids using either Solar PV or Coconut Oil biofuel in diesel generators. These RESCOs have sought to provide energy that supports economic activities that generate cash incomes for rural communities and enables them to improve their opportunities, healthcare, connectivity, and education for their children.

11. **Component 2 — Grid Extensions**. Component 2 would finance grid extensions to both the Honiara grid and Auki grid after their expected conversion to being predominantly supplied using renewable energy via the proposed Tina River Hydro Scheme (Honiara) and Fiu River Hydro scheme (Auki). The large displacement of fossil fueled generation on both the Honiara and Auki grids is expected to improve energy affordability, relative to the present, and contribute to further improvements in financial performance of SIEA. The combination of improved affordability of energy and profitability would contribute to improvements in the economics and financial returns from connecting new customers near existing grids, who are currently considered uneconomic to connect by the utility. Studies by the World Bank and SIEA have identified a range of possible grid extensions in and around the towns of Auki and Honiara — in particular peri-urban areas that do not currently have access to nearby electricity supplies. Such grid extensions might be good candidates for Output Based Aid (OBA), whereby a one-off subsidy payment could be made to service providers (e.g. SIEA or Rural Energy Supply Companies (RESCOs)) for connecting new customers to the grids.

Box 1: What is OBA?

Output Based Aid (OBA) is a way to increase access of low income households to basic infrastructure and social services.

OBA is one of the tools under the broader results based financing (RBF) umbrella and should not be confused with other RBF approaches, such as Cash on Delivery.

OBA is used when low-income households are excluded from accessing basic services because they cannot afford to pay the upfront or ongoing user fees, and it is not financially viable for service providers (private, public or NGOs) to lower their fees. In these situations, OBA addresses an "affordability issue" by financing (with grant aid, or governments own money) the gap between what households can pay and what service providers must charge.

OBA can also be used to stimulate investment in new infrastructure to un-serviced areas. Often the private sector or state-owned utility providers are unwilling or unable to build infrastructure in areas where poor people live – namely rural areas or informal urban settlements – because of higher real or perceived costs that cannot be transferred onto customers through higher user fees. In these situations, the OBA grant bridges the gap between an un-commercial and commercially viable investment.

OBA is essentially a new way of thinking about how to effectively and efficiently design subsidies in order to stimulate investment by the private (or public) sector. However, OBA brings three key points of difference to conventional subsidy programs:

Firstly, OBA service providers are usually selected through a competitive least-cost subsidy tendering process (where there is not an incumbent provider). This process, coupled with household surveys to determine appropriate household contributions, leads to efficiency gains in the subsidy size.

Secondly, the subsidy is only paid to the service provider after they have delivered the services and the outputs have been independently verified. This means that the service provider has to prefinance the implementation costs. This shifts the performance risk to the service provider as pre-financed implementation costs are only recovered according to their performance. It also creates space for innovation as the service solutions are left up to the service provider.

Thirdly, the subsidised fee is targeted to poor households through geographic targeting, means testing, self-selection or a combination of approaches.

12. **Component 3 — Enabling Environment.** Component 3 would finance three specific areas of technical assistance that would create an enabling environment to support the Scaling Up of Renewable Energy in Solomon Islands: (a) Standardized and streamlined approaches for land acquisition for distribution extensions and small mini-grids; (b) Amendments to the Electricity Act and Petroleum/Biofuels laws and regulations; and (c) Improving the SIEA's power system planning and project management capacity. Table 1 provides further details on the objectives and expected outcomes of this technical assistance, and how it would contribute to improving the enabling environment.

Table 1: Improving the Enabling Environment for Scaling Up of Renewable Energy

Objective of technical assistance	Outcomes
Standardized and streamlined approaches for land acquisition for distribution extensions and small mini-grids	Create enabling environment to improve speed with which land acquisition for distribution extensions and small mini-grids can be developed.
Amendments to the *Electricity Act* and Petroleum/Biofuels laws and regulations	Reform the *Electricity Act* to permit grid extension and off-grid (mini-, micro- and pico-systems) development using implementation and financing options based on state, private and community ownership using a range of business models: • Utility service delivery model, in which SIEA retails electricity to consumers connected to one of its grids; • Rural Electrification Service Company (RESCO) service delivery model, in which a developer retails electricity to consumers connected to a grid extension or a mini-grid it has developed within its licence area; • Community-based service delivery model, in which a community develops an electrification system and supplies electricity on a non-profit basis; • Direct purchase model, in which villagers purchase pico-systems (primarily solar PV) to electrify their households. Update *Petroleum Act* so that it addresses a range of matters relating to biofuels, including: storage and handling, blending with mineral fuels, and fuel quality standards.
Improving the SIEA's power system planning and project management capacity.	The national power utility is likely to play a key role in planning, developing and operating and maintaining a range of renewable energy systems across the country. The SIEA is also the training ground for many electricians and engineers, some of who have gone to establish or work for RESCOs. SIEA has a role in licensing electricians and regulating electrical safety. Strengthening both the SIEA's capacity in power system planning, and its ability to deliver capital projects across the Solomon Islands, would underpin efforts to Scale Up Renewable Energy in the country and in meeting its statutory obligations under the *Electricity Act* to: i) "promote and encourage the generation of electricity with a view to the economic development of Solomon Islands"; ii) "to secure the cost of electricity at reasonable prices"; and iii) "to establish, manage and operate electric power systems".

13. The project supports Solomon Islands' *National Development Strategy 2011-2020*, which prioritizes development of reliable and affordable power supply in urban centers through renewable energy and prioritizes increasing electricity access. The proposed project also supports: a) Solomon Islands' *National Energy Policy Framework, 2007* and the *Draft National Energy Policy Framework, 2013* — both of which both prioritize development of renewable energy; and b) the draft *Solomon Islands' Renewable Energy Investment Plan, 2013*.

C. PROPOSED CONTRIBUTION TO INITIATING TRANSFORMATION

14. Supporting improved access to electricity from the abundant renewable energy sources in Solomon Islands, through a combination of grid extensions, mini-grids, and the creation of an enabling environment, will catalyze the economic transformation of the households and communities reached. The design and implementation of these grid extensions and mini-grids would draw on global best practice and adapt it to the social, environmental, institutional and business environment of Solomon Islands. The objective is to develop sustainable OBA models that involve the power utility, community based power supply companies

and RESCOs in efficiently delivering and maintaining energy supplies to new customers. Project benefits will be extended through employment of local communities during the construction period.

D. IMPLEMENTATION READINESS

15. The Ministry of Mines, Energy and Rural Electrification (MMERE) and SIEA have full ownership of the proposed project. SIEA has identified and costed a range of grid extensions around Honiara and its other grids, including Auki, that it would consider carrying out in the event that a streamlined process for resolving access to customary land was developed and the attractiveness of new household connections improved. MMERE is intimately involved in the design and implementation of village level renewable energy projects across Solomon Islands, including household and village solar PV systems, micro-hydro projects, and in working with RESCOs. The proposed project will build on lessons learnt and experiences from previous projects.

E. RATIONALE FOR SREP FUNDING

16. Arising from a range of financial, institutional, geographic and historical challenges in Solomon Islands, access to electricity is very low, despite the country's abundance renewable energy. SREP support is required to support Solomon Islands with its efforts to utilize these renewable energy resources to improve the economic opportunities and prospects and health and educational outcomes for its citizens. SREP assistance is required to develop sustainable models for the provision of grid extensions and rural mini-grids. SREP support is also needed to create the enabling environment for scaling up renewable energy in Solomon Islands; focusing on three areas: a) Standardized and streamlined approaches for land acquisition for distribution extensions and small mini-grids; b) Amendments to the *Electricity Act* and Petroleum/Biofuels laws and regulations; and c) Improving the SIEA's power system planning and project management capacity.

Table 2: Summary of Projects Responsiveness to SREP Criteria

Criteria	Components 1 & 2: Mini-grids and Grid extensions
Increased installed capacity from renewable energy sources	SREP funding would assist in electrification of: a) an estimated 3000 households through grid extensions to the grids at Auki and Honiara after they become predominantly fed by renewable energy; and b) up to 60 villages via renewable energy mini-grids in rural areas that would support economic development there.
Increased access to energy through renewable energy sources	An Output Based Aid model would be used to support increased access to renewable energy for the poorest households.
Low emissions development	The component would expand access to electricity through increasing connections to distribution grids and mini-grids whose principal source of energy is renewable.
Affordability and competitiveness of renewable sources	Hydropower supplied to Honiara and Auki grids would be significantly lower cost compared to existing diesel generation. Renewable energy supplied into remote mini-grids is expected to be highly competitive against small scale diesel generation.
Productive use of energy	Grid extensions and mini-grids will increase productive use of energy by allowing reliable, safe, low cost and high quality electricity for: a) productive activities during the evening, including improved education; b) access to communication; c) small retail ventures; d) communal freezers that can be used to preserve fish and make ice, so it can be shipped to market and generate income; and e) handicrafts manufacturing.
Social and environmental development impact	Social impacts will generally be positive. Environmental impacts are expected to be minimal. Project design will assess social and environmental safeguards.
Economic and financial viability	Project design will ensure that Output Based Aid model is financially attractive to the private sector and is sustainable over time.
Leveraging of additional resources	SREP support will leverage an estimated $3 million private sector financing $7 million World Bank financing and $5 million from The Government of Solomon Islands and SIEA.
Gender equity	Increased household electrification is expected to have significantly positive gender benefits, with the impact by gender varying depending on both patterns of energy

Criteria	Components 1 & 2: Mini-grids and Grid extensions
	usage and the economic activity/entrepreneurship.
Co-benefit of renewable energy scale-up	Development of the enabling environment is expected to significantly boost the capacity to upscale renewable energy in Solomon Islands.

F. RESULTS INDICATORS

17. The main results indicators, to be further elaborated on during project preparation, will comprise the following:

Table 3: Results, Indicators and targets

Results	Indicators	Targets
1. Increase in renewable energy supply to Honiara grid	Renewable energy generation increased as a percentage of Honiara power generation	TBD
	Reduced diesel imports for power generation	18 ML by Dec 2018
2. Increase in households with access to renewable energy	Increased number of households connected to Honiara and Auki grids	3000 by Dec 2018
	Villages with mini-grids installed	60 by Dec 2018
3. Increase in investments from private sector in renewable energy	USD$ invested	$3 million by Dec 2018
3. Greenhouse Gas emissions mitigated	CO_2 emissions reduction	58,551 tCO_2e per year by Dec 2018
4. Capacity building undertaken for Solomon Islands Electricity Authority and RESCOs	Output Based Aid evaluation and design study for grid extensions and mini-grids	Study completed by October 2015
	Mini-grid design, operation and maintenance workshops	5 workshops February 2016 - February 2017
5. Capacity building undertaken for project beneficiaries	Training workshops for newly grid-connected households and those for whom mini-grids are being developed; including power safety, household utility budget and business skills training.	Training for all newly connected households by June 2017

Source: World Bank and Government of Solomon Islands estimates

G. FINANCING PLAN

18. The total estimated project cost is $21.7 million, of which $6.7 million is sought from the SREP, and $7.0 million from the World Bank Group. The Government of Solomon Islands, SIEA and private sector will also contribute to the project (Table 4).

Table 4: Proposed Financing Plan for WBG Renewable Energy Access Project

	Private Sector	SREP	WBG	Government	SIEA	Total
1. Renewable Energy Mini-Grids	3.0	5.4	2.5	2.0	–	**12.9**
2. Grid extensions	**–**	-	3.5	1.0	2.0	**6.5**
3. Project Preparation	–	0.5	–	–	–	**0.5**
4. Technical assistance	–	1.0	1.0	–	–	**2.0**

TOTAL	**3.0**	**6.9**	**7.0**	**3.0**	**2.0**	**21.9**

SIEA: Solomon Islands Electricity Authority, WBG: World Bank Group

Source: WB, SIEA, and Solomon Islands Government estimates

H. LEAD IMPLEMENTING AGENCIES

19. The MMERE is the executing agency on behalf of the Government of Solomon Islands, while the World Bank will serve as the lead MDB. It is envisaged that the Solomon Islands Electricity Authority would be the implementing agency for the grid extensions component, and the MMERE would be the implementing agency for the Mini-grids component.

I. PROJECT PREPARATION TIMETABLE

20. The estimated project preparation timetable is presented below:

Table 5: Proposed Schedule

Milestones	Expected Completion Date
SREP Sub Committee approve Project Preparation Grant	June 2014
WB approve Project Preparation Technical Assistance (PPTA)	December 2014
Mobilize PPTA consultants	April 2015
Complete Project Design	October 2015
SREP Sub Committee Approval	November 2015
WB Board Consideration	March 2016

Source: WB/Solomon Islands Government estimates

J. PROJECT PREPARATION GRANT

21. The Government of Solomon Islands is requesting a preparatory grant of USD500,000 to prepare this project.

Table 6: MDB Request for Payment for Project Implementation Services (MPIS)

SCALING UP RENEWABLE ENERGY IN LOW-INCOME COUNTRIES **MDB Request for Payment of Implementation Services Costs**			
1. **Country/Region**:	Solomon Islands	2. **CIF Project ID**#:	
3. **Project Title:**	*Renewable Energy Access Project*		
4. **Request for project funding (USD$million):**	*At time of country submission (tentative): $6.9 million*	*At time of project approval:*	
5. **Estimated costs for MDB project implementation services (USDmillion):**	*Initial estimate - at time of Country submission: US$0.428 million* *Final estimate - at time of project approval: n/a*	*MDB: World Bank Group* *Date: May 2014*	
6. **Request for payment of MDB Implementation Services Costs:**	☐ First tranche: US$0.170 million		
7. **Project financing category:**	a - Investment financing - additional to ongoing MDB project ☐ b- Investment financing - blended with proposed MDB project √ c - Investment financing - stand-alone ☐ d - Capacity building - stand alone ☐		
8. **Expected project duration** (no. of years):	4 years		
9. **Explanation of final estimate of MDB costs for implementation services:**	*Not applicable*		
10. **Justification for proposed stand-alone financing in cases of above 6 c or d:** not applicable			

Table 7: SREP Project Preparation Grant Request by WBG

SREP **Project Preparation Grant Request**			
1. **Country/Region**:	Solomon Islands	2. **CIF Project ID#**:	
3. **Project Title:**	*Renewable energy access project*		
4. **Tentative SREP Funding Request (in US million total) for Project at the time of Investment Plan submission (concept stage):**:	*Grant:$6.9 million*	*Loan: $0*	
5. **Preparation Grant Request (in USD):**	$0.5 million	MDB: World Bank	
6. **National Project Focal Point**:	John Korinihona Director, Energy Division Ministry of Mines, Energy and Rural Electrification		
7. **National Implementing Agency (project):**	Ministry of Mines, Energy and Rural Electrification		
8. **MDB SREP Focal Point and Project Task Team Leader (TTL)**:	*SREP Focal Point:* Mr. Gevorg Sargsyan Program Coordinator, SREP, World Bank Email: gsargsyan@worldbank.org	*Task Team Leader (TTL):* Mr. Tendai Gregan Energy Specialist East Asia and the Pacific World Bank Email: tgregan@worldbank.org	

9. **Description of activities covered by the preparation grant:**

A preparation grant is required to:

(i) prepare feasibility study level designs for grid extensions and a mini-grids;

(ii) critically review legal and regulatory arrangements that are inhibiting the scaling up of renewable energy in Solomon Islands and draft new instruments to improve the enabling environment;

(iii) conduct market analysis (including household survey) and design Output Based Aid models for mini-grids and grid extensions;

(iv) undertake capacity building for SIEA, MMERE and private sector for implementation under the Project;

(iv) familiarize and/or strengthen the implementing agencies' capacity to implement the World Bank's procurement procedures, disbursement procedures, and safeguard requirements.

Various aspects of due diligence will be conducted through the preparation grant:

(i) **Technical.** Appropriate technology for mini-grids and grid extensions is be assessed, particularly related to operating and maintenance requirements.

(ii) **Economic and financial.** Economic and financial analysis will be undertaken of the project in accordance with the World Bank's financial management and analysis and economic analysis guidelines.

(iii) **Procurement.** Procurement capacity assessment of SIEA and MMERE will be undertaken. Procurement packages will be prepared.

(iv) **Institutional Capacity.** Capacity assessment of SIEA will include procurement capacity, project management capacity and financial management capacity.

(v) **Safeguards, Social, Poverty and Gender.** All safeguards will be addressed according to the World Bank's Safeguards Policies. Environmental assessment will ensure environmental impacts are mitigated. Land acquisition and impact on indigenous peoples will be assessed and resettlement and indigenous peoples plans prepared, as required. Social, poverty and gender analysis will be conducted. A gender action plan will be prepared.

(vi) **Private Sector.** Design alternative models for engagement of private sector.

10. **Outputs:**

Deliverable	**Timeline**
(a) Inception Report	May 2015
(b) Interim Report	July 2015
(c) Draft Final Report	September 2015

(d) Final Report	November 2015
11. **Budget (indicative):**	
Expenditures	**Amount (USD) -** estimates
Consultants	$350,000
Equipment	$10,000
Local workshops/seminars	$20,000
Travel/transportation	$60,000
Others (admin costs/operational costs)	$10,000
Contingencies (max. 10%)	$50,000
Total Cost	**$500,000**
Other contributions:	
• Government	$200,000 (in-kind)
• MDB	-
• Private Sector	-
• Others (please specify)	-
12. **Timeframe** (tentative) SREP Sub-Committee Approval of project: *June 2014* Expected World Bank Board approval date: *July 2015*	
13. **Other Partners involved in project design and implementation**: • SIEA (Solomon Islands Electricity Authority) • MMERE (Ministry of Mines, Energy and Rural Electrifications) • Australian Ministry of Foreign Affairs and Trade • New Zealand Department of Foreign Affairs • Asian Development Bank	
14. **If applicable, explanation for why the grant is MDB executed:** Due to its limited capacity in handling the timely contractual preparation of such a consultancy, the Government of Solomon Islands has requested that the grant be executed by the World Bank.	
15. **Implementation Arrangements** (incl. procurement of goods and services)**:** The executing agency will be MMERE. The SIEA would be the implementing agency for the grid extension component, and the MMERE would be the implementing agency for the mini-grids component. A Project Steering Committee (PSC) will be established to review project progress, coordinate inter-ministerial activities and guide the Project Management Unit (PMU), which will be established within MMERE for Component 1 (mini-grids) and within SIEA for Component 2 (grid extensions). The PMU will be supported by implementation consultants. All equipment and civil works procurement will be carried out in accordance with the policies, procedures and processes set out in the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits," dated January 2011 (Procurement Guidelines). Consultants will be recruited in line with "Guidelines: Selection and Employment of Consultants by World Bank Borrowers," dated January 2011 (Consultant Guidelines).	

Annex 5: Project Concept 2: Solar Power Development Project

A. PROBLEM STATEMENT

1. **Over-reliance on Diesel Generation resulting in high power tariffs**. All grid-connected power generation in Solomon Islands is currently diesel generated, which has resulted in power tariffs amongst the highest in the Pacific. In June 2013, the national uniform tariff was $0.85/kWh to residential customers and $0.91/kWh to commercial customers. By comparison, the Pacific Power Association, Performance Benchmarking Report for Pacific Power Utilities, 2013 indicates that the average domestic tariff across 21 Pacific utilities in 2011 was $0.46/kWh. The high cost of electricity and the limited reach of the distribution grid is negatively impacting economic growth. In particular, the agricultural and tourism industry are impeded.

2. **Low Technical Capacity with Renewable Energy**. Grid-connected electricity is generated and supplied in Solomon Islands by Solomon Islands Electricity Authority (SIEA), which is a state-owned electricity utility. SIEA provides electricity to the national capital (Honiara) and eight isolated provincial centers on separate islands (Auki, Buala, Gizo, Kirakira, Lata, Malu'u, Noro-Munda, and Tulagi). Installed capacity in Honiara is 26MW (peak load 14.3MW) and combined installed generation capacity in the provincial centers is 4MW. As 100% of grid-connected electricity is diesel generated, SIEA has no experience or human resource capacity in managing renewable energy integration into the grid. This lack of experience with planning, construction, operation and maintenance of renewable energy is a barrier to upscaling renewable energy in the Solomon Islands.

3. **Low Access Rates**. Electricity access is extremely low in Solomon Islands. Solomon Islands has a total population of 512,870 and the capital Honiara, located in Guadalcanal has a population of 64,609 (13% total population). Grid-connected electricity is supplied to approximately 12% of the population on a national basis. The overall access rate in Honiara is 64%, however access in the remainder of the country is 6%, with 5 out of 9 provinces having access rates below 4%. The main reasons for the low access rates are (i) difficult geography and dispersed small size of population centers, (ii) lack of Government community service obligation funding for grid extensions, (iii) high cost of diesel power generation in the provincial centers which provides a disincentive to the corporatized SIEA to expand the distribution network (where cost of generation exceeds national tariff), and (iv) low capacity to pay in some areas. Due to dispersed nature of the population and difficulty with physical access options for grid extension are limited.

4. **Unsustainable Household Solar Systems**. Over the past 2 decades there have been a significant number of household systems given to households for free as part of donor supported projects or politically funded distribution schemes. Surveys and anecdotal evidence indicates that the majority of these systems are not maintained adequately, fail in a relatively short period, and do not deliver anticipated development impacts. There is a nascent industry of equipment suppliers and system maintenance providers established in Solomon Islands, however the market is distorted by the grant nature of the current funding system. The current system is unsustainable due to (i) lack of private sector involvement in the supply and maintenance of the solar home system equipment, (ii) lack of standards for solar equipment, (iii) absence of battery recycling system, (iv) lack of trained technicians for system maintenance, (v) lack of incentives for households to properly maintain equipment which was provided free of charge and expectations by households for free replacement systems, (vi) intermittent household incomes for regular maintenance payments for household solar systems, and (vii) distributed population centers and low economies of scale for service providers.

B. PROJECT OBJECTIVE

5. The project will increase grid-connected solar power generation on the existing main electricity grids and increase energy access through private sector led household solar system rollout in rural areas of Solomon Islands. The project will achieve this objective by: (i) constructing 2MW of trial grid-connected solar power on the main grids, (ii) supporting private sector to establish fee-for-service roll out of household solar systems in rural areas of the Solomon Islands, and (iii) creating the enabling environment and strengthening institutional and human resource capacities.

6. **Component 4: Grid-connected solar power**. Component 4 will include constructing a total of 2MW grid-connected solar generation at 4 locations on the SIEA grid (Lungga diesel powerplant site, SIEA office, 2 outstations). The solar plant would be owned and operated by SIEA. Increased solar generation will benefit the economy through (i) reduced importation of fossil fuels, (ii) improved energy security, and (iii) reduced tariff volatility due to partial conversion of the national grid to renewable energy. Utilization of renewable energy also reduces greenhouse gas emissions which contribute to global warming. In order to establish the

enabling environment for grid-connected solar power, Component 4 will include (i) training of SIEA staff in operation and maintenance of solar plants, including grid integration, and (ii) preparation of a grid integration analysis.

7. **Component 5: Upscaling household solar power**. Component 5 will include development of a private sector fee-for-service model to install, own, operate and maintain household solar systems for rural households. Component 5 will fully design the model, undertake private sector capacity building and partially subsidize equipment costs. Ownership of the household solar systems will remain with the private sector and households will pay an upfront fee for service deliver to cover operation and maintenance costs and partial asset depreciation. This will assist with addressing (i) irregular income generation in rural areas, (ii) need for regular external maintenance, and (iii) difficulties with tariff collection from remote locations. Requiring households to pay for electricity services (below current costs of kerosene) will improve ownership of the systems and address the lack of ownership demonstrated with free systems. In order to establish the enabling environment for upscaling household solar power, Component 5 will include (i) competitive bidding of partially subsidized contract for private sector to own and operate fee-for-service household solar system assets, (ii) development of national standards for solar installations, (iii) training of private sector in business management, and (iv) training of newly connected households in options for income generation through electricity, electricity safety and household budget management.

8. The project supports Solomon Islands National Development Strategy 2011-2020, which prioritizes development of reliable and affordable power supply in urban centers through renewable energy and prioritizes increasing electricity access. The proposed project supports Solomon Islands *National Energy Policy Framework, 2007* and the *Draft National Energy Policy Framework, 2013*, which both prioritize development of renewable energy. The project also supports the draft *Solomon Islands Renewable Energy Investment Plan, 2013*.

C. PROPOSED CONTRIBUTION TO INITIATING TRANSFORMATION

9. There is currently no utility based grid-connected solar power in the Solomon Islands. The proposed grid-connected solar would provide SIEA with initial experience in operating and managing solar power generation and contribute to subsequent upscaling of solar power. The project would also transform local supply chains to supply and maintain the assets.

10. Development of a fee-for-service private sector model for supply and maintenance of household solar systems will transform the existing handout model to a sustainable private sector led model. The household solar systems will directly benefit new households through (i) replacing kerosene lighting with a cheaper form of energy, thereby freeing household expenditure, (ii) enable household income generation, (iii) improved children education, (iv) reduced indoor health and safety issues associated with burning firewood and kerosene, and (v) reduced fire hazards caused by toppled wick lamps. Project benefits will be extended through employment of local communities during the construction period.

D. IMPLEMENTATION READINESS

11. The Ministry of Mines, Energy and Rural Electrification (MMERE) and SIEA have full ownership of the proposed project. SIEA has identified sites adjacent to existing powerplants for the grid-connected solar assets and have received independent technical advice about the benefits of proceeding with solar power for their grid. JICA is currently implementing a quasi-private sector household solar system project with encouraging results. The proposed project will build on lessons learnt and experiences from previous projects. MMERE has extensive experience in managing implementation of donor supported solar power projects for remote schools and clinics.

E. RATIONALE FOR SREP FUNDING

12. Due to the lack of experience with grid-connected solar power generation, SREP support is required to support SIEA with their initial installations to build capacity. There is a lack of sustainable models for sustainable supply and maintenance of household solar systems in the Solomon Islands. There is limited capacity within the villages to maintain household systems once installed. SREP assistance is therefore required to develop a sustainable private-sector driven household solar system model. SREP support is also needed to create the enabling environment for introduction of solar power into Solomon Islands, including system modeling for solar power integration and capacity building activities. SREP funding will also catalyze additional financing from the private sector and ADB. The proposed project is responsive to the SREP Investment Evaluation Criteria (see below).

Table 1: Summary of Projects Responsiveness to SREP Criteria

Criteria	Component 4 Grid-connected solar power	Component 5 Upscaling Household solar power
Increased installed capacity from renewable energy sources	SREP funding would assist in 2MW installed solar capacity on the Honiara grid.	SREP funding would assist in electrification of an additional 2,000 households through renewable energy (solar home systems)
Increased access to energy through renewable energy sources	-	The component would target supplying 2,000 households with access to renewable energy, who are currently not connected to modern energy services.
Low emissions development	The grid-connected solar would be the first renewable energy project for the Honiara grid and the first grid-connected solar power project in the Solomon Islands. It will build capacity within SIEA to expand solar power.	The component would expand access to electricity through low emission household solar systems.
Affordability and competitiveness of renewable sources	Grid-connected solar is least cost compared to existing diesel generation.	Household solar is least cost compared to current kerosene lighting and small scale diesel generation.
Productive use of energy	-	Household solar systems will increase productive use of energy by allowing reliable, safe, low cost and high quality electricity for productive activities during the evening, including improved education, access to communication, small retail ventures and handicrafts manufacturing.
Social and environmental development impact	Social impacts are anticipated to be positive and environmental impacts manageable. SIEA has already identified alienated land for the proposed solar plant so land acquisition issues are expected to be minimal. Project design will assess social and environmental safeguards.	Social impacts will generally be positive. Environmental impacts are expected to be minimal. Project design will assess social and environmental safeguards.
Economic and financial viability	Grid-connected solar generation has been shown to be marginally financially viable in the Pacific. Project design will assess financial and economic rates of return.	Project design will ensure that the fee-for-service model is financially attractive to the private sector.
Leveraging of additional resources	SREP support will leverage $4.5 million ADB financing.	SREP support will leverage $1 million private sector financing and $1 million ADB financing.
Gender equity	Grid-connected solar generation is not expected to have significant gender impact.	Increased household electrification is expected to have significantly positive gender benefits.
Co-benefit of renewable energy scale-up	The project will increase capacity in SIEA to scale up renewable energy. The project would be the first grid-connected renewable energy project in the Solomon Islands.	Development of a sustainable private sector model will have significant capacity for upscaling solar power for households.

F. RESULTS INDICATORS

13. The main results indicators, to be further elaborated on during project preparation, will comprise the following:

Table 2: Indicators and Targets

Results	Indicators	Targets
1. Increase in renewable energy supply to Honiara grid	Installed grid-connected photovoltaic solar power	2MW
	Renewable energy generation increased as a percentage of Honiara power generation	X% (XGWh) by January 2018
	Reduced diesel imports for power generation	XML by January 2018
2. Increase in households with access to renewable energy	Number of households with installed household solar systems	2,000
3. Greenhouse Gas emissions mitigated	CO_2 emissions reduction	X tCO_2e by January 2018
4. Capacity building undertaken for Solomon Islands Electricity Authority	Grid interconnection study	Study completed by December 2014
	Grid-connected Solar operation and maintenance workshops	5 workshops February 2016 - February 2017
5. Capacity building undertaken for project beneficiaries	Training workshops for newly connected households including power safety, household utility budget and business skills training	Training for all newly connected households by February 2017

Source: ADB and Government of Solomon Islands estimates

G. FINANCING PLAN

14. The total estimated project cost is $16.7 million, of which $6.7 million is sought from the SREP, and $6.5 million from the Asian Development Bank. The Government of Solomon Islands and private sector will also contribute to the project.

Table 3: Proposed Financing Plan

	Private Sector	SREP	ADB	Government	Total
ADB: Solar Power Development Project					
1. Grid-connected solar power	-	3.8	4.5	1.5	9.8
2. Upscaling household solar power	1.0	1.0	1.0	1.0	4.0
3. Project Preparation	-	1.0	-	-	1.0
4. Technical assistance	-	1.0	1.0	-	2.0
Total	**1.0**	**6.8**	**6.5**	**2.5**	**16.8**

Source: ADB/Solomon Islands Government estimates

H. LEAD IMPLEMENTING AGENCIES

15. The MMERE is the executing agency on behalf of the Government of Solomon Islands, while the ADB will serve as the lead MDB. The Solomon Islands Electricity Authority will be the implementing agency for the grid-connected solar component, and MMERE will be the implementing agency for the household solar component.

I. PROJECT PREPARATION TIMETABLE

16. The estimated project preparation timetable is presented below:

Table 4: Proposed Schedule

Milestones	Expected Completion Date
SREP Sub Committee Meeting approve Project Preparation Grant	June 2014
ADB approve Project Preparation Technical Assistance (PPTA)	February 2015
Mobilize PPTA consultants	April 2015
Complete Project Design	October 2015
SREP Sub Committee Approval	November 2015
ADB Board Consideration	March 2016

Source: ADB/Solomon Islands Government estimates

J. PROJECT PREPARATION GRANT

17. The Government of Solomon Islands is requesting a preparatory grant of USD1,000,000 to prepare this project.

Table 5: MDB Request for Payment for Project Implementation Services (MPIS)

<table>
<tr><td colspan="4">SCALING UP RENEWABLE ENERGY IN LOW-INCOME COUNTRIES
MDB Request for Payment of Implementation Services Costs</td></tr>
<tr><td>Country/Region:</td><td>Solomon Islands</td><td>CIF Project ID#:</td><td></td></tr>
<tr><td>Project Title:</td><td colspan="3">Solar Power Development Project</td></tr>
<tr><td>Request for project funding (USD$million):</td><td>At time of country submission (tentative): US$6.8 million</td><td colspan="2">At time of project approval:</td></tr>
<tr><td rowspan="2">Estimated costs for MDB project implementation services (USDmillion):</td><td rowspan="2">Initial estimate - at time of Country submission: US$0.428 million

Final estimate - at time of project approval: n/a</td><td colspan="2">MDB: Asian Development Bank</td></tr>
<tr><td colspan="2">Date: May 2014</td></tr>
<tr><td>Request for payment of MDB Implementation Services Costs:</td><td>☐ First tranche: US$0.170 million</td><td colspan="2"></td></tr>
<tr><td>Project financing category:</td><td colspan="3">a - Investment financing - additional to ongoing MDB project ☐
b- Investment financing - blended with proposed MDB project √
c - Investment financing - stand-alone ☐
d - Capacity building - stand alone ☐</td></tr>
</table>

Expected project duration (no. of years):	4 years
Explanation of final estimate of MDB costs for implementation services:	*Not applicable*
Justification for proposed stand-alone financing in cases of above 6 c or d: not applicable	

Table 6: Project Preparation Grant Request

SREP			
Project Preparation Grant Request			
Country/Region:	Solomon Islands	**CIF Project ID**#:	
Project Title:	*Solar Power Development Project*		
Tentative SREP Funding Request (in US million total) for Project at the time of Investment Plan submission (concept stage)::	*Grant: US$6.8 million*	*Loan: $0*	
Preparation Grant Request (in USD):	US$1 million	MDB: Asian Development Bank	
National Project Focal Point:	John Korinihona Director, Energy Division Ministry of Mines, Energy and Rural Electrification		
National Implementing Agency (project):	Ministry of Mines, Energy and Rural Electrification		
MDB SREP Focal Point and Project Task Team Leader (TTL):	*SREP Focal Point:* Jiwan Acharya Senior Climate Change Specialist (Clean Energy) Asian Development Bank	Anthony Maxwell Senior Energy Specialist Pacific Department Asian Development Bank	

Description of activities covered by the preparation grant:

A preparation grant is required to (i) prepare feasibility study level design for grid-connected solar generation, (ii) undertake grid-integration study for intermittent renewable energy, (iii) conduct market analysis (including household survey) and design private sector led household solar system project, (iv) undertake capacity building for SIEA, MMERE and private sector for implementation under the Project, and (v) familiarize the implementing agency with ADB's procurement procedures, disbursement procedures, and safeguard requirements. Various aspects of due diligence will be conducted through the preparation grant:

A. Technical. Appropriate technology for solar power will be assessed, particularly related to operating and maintenance requirements.
B. Economic and financial. Economic and financial analysis will be undertaken of the project in accordance with ADB's financial management and analysis and economic analysis guidelines.
C. Procurement. Procurement capacity assessment of SIEA will be undertaken. Procurement packages will be prepared.
D. Institutional Capacity. Capacity assessment of SIEA will include procurement capacity, project management capacity and financial management capacity.
E. Safeguards, Social, Poverty and Gender. All safeguards will be addressed according to the ADB Safeguard Policy Statement, June 2009. Environmental assessment will ensure environmental impacts are mitigated. Land acquisition and impact on indigenous peoples will be assessed and resettlement and indigenous peoples plans prepared, as required. Social, poverty and gender analysis will be conducted. A gender action plan will be prepared.

Outputs:

Deliverable	**Timeline**
(a) Inception Report	May 2015

(b) Interim Report	July 2015
(c) Draft Final Report	September 2015
(d) Final Report	November 2015
Budget (indicative):	
Expenditures	**Amount (USD) -** estimates
Consultants	$680,000
Equipment	$50,000
Local workshops/seminars	$20,000
Travel/transportation	$105,000
Others (admin costs/operational costs)	$45,000
Contingencies (max. 10%)	$100,000
Total Cost	**$1,000,000**
Other contributions:	
• Government	$200,000 (in-kind)
• MDB	-
• Private Sector	-
• Others (please specify)	-

Timeframe (tentative)
Submission of pre-appraisal document for SREP Sub-Committee Approval: *September 2013*

Expected Board/MDB Management approval date: *Project Preparation Technical Assistance approval June 2014*

Other Partners involved in project design and implementation:

- Solomon Islands Electricity Authority (SIEA)
- Ministry of Mines, Energy and Rural Electrification (MMERE)
- World Bank
- Australian Aid
- New Zealand Aid Programme

If applicable, explanation for why the grant is MDB executed:
The Government of Solomon Islands has requested ADB to execute the grant due to its limited capacity in handling the timely contractual preparation of such a consultancy.

Implementation Arrangements (incl. procurement of goods and services)**:**
The executing agency will be MMERE. The implementing agency for the grid-connected solar component will be SIEA and the implementing agency for the household solar component will be MMERE. A Project Steering Committee (PSC) will be established to review project progress, coordinate inter-ministerial activities and guide the Project Management Unit (PMU), which will be established within SIEA for the grid-connected solar component and within MMERE for the household solar component. The PMU will be supported by implementation consultants. All equipment and civil works procurement will be carried out in accordance with ADB's *Procurement Guidelines* (2010, as amended from time to time). Consultants will be recruited in line with ADB's *Guidelines on the Use of Consultants* (2010, as amended from time to time), through consulting firm or individual selection method. The procurement method would be international competitive bidding (ICB) or shopping procedures (international).

Annex 6: Independent Quality Review

1.0 Comments Response Matrix

Name of Reviewer: Dr Mike Allen

Date of Review: 15th April 2014

	Comment	Response
1.	Component 1: Renewable Energy Mini-grids. It is noted that there is very limited experience with bio-fuels to date; while the opportunity for coconut-oil (CNO) based biofuels is being considered it is perhaps important that this be reviewed in the light of experience elsewhere. While the concept of using coconut oil has been considered fairly widely in the Pacific, despite there being large numbers of coconut plantations, these are often old and have not been replanted; oil production has not been easy to establish and maintain. Anecdotal reports from Vanuatu for example suggest that UNELCO set up its own supply and production facility after failing to get adequate sustainable supplies of oil from external contractors.	Fuel (CNO) supply will be a key design consideration when selecting mini-grid sites. Significant experience elsewhere in the Pacific with CNO as a diesel substitute will be assessed.
2.	Component 2: Grid Extensions. Grid Extension Design. Has this been the past practice that customers finance internal wiring? Are there any issues of affordability?	Proposed Output Based Aid financing will include basic household wiring. This is considered sufficient for most low income houses.
3.	Component 2: Grid Extensions. Grid Extension Design. The grid connection offered will be the minimum technical feasible solution and as such targeted at entry level customers, i.e. the capacity of the connection offered will be insufficient to supply commercial or industrial customers or residential customers that have large loads. Is this the most appropriate approach, to utilise a minimum technically feasible solution? What is the real cost differential between this and a more robust solution that will set high standards from the outset and will avoid the risk that customers may attempt to draw higher loads through poorly specified connections? Should the system be designed with future demand growth in mind? Safety should be a key consideration.	Distribution design will match anticipated power requirements. Load areas with high potential for power utilization to drive economic development (e.g. agribusiness value adding) will be connected to more robust connections (e.g. 3 phase). However, it is anticipated that most connections will be for basic household usage, which in general does not substantiate the high cost of industrial/commercial connections.
4.	Component 3: Renewable Energy Enabling Environment. While landowner participation in projects may not be an appropriate local solution in all situations, it is suggested that it be considered. Income from the one-off sale of land or through royalties can seem appealing to both sides as a project is being conceived. However experience has shown that where there can be a modest level of equity participation by land owners there are a number of benefits that take into account ancestral and cultural consideration; see all parties bearing some of the underlying development risks (eg the avoidance of extended project timetables where land ownership becomes the most important stumbling block) and ensures that all parties have a share in the ongoing income from the project. The goals of all parties are aligned, rather then there being a growing separation of interests where landowners can feel increasingly	The potential benefits of landowner equity ownership are recognized. This will be considered in detail during project design.

	disenfranchised as they observe others benefitting from a commercially successful venture in which they have no participation.	
5.	Component 4: Grid-connected Solar Power. It is noted in the IP that: *Increased solar generation will benefit the economy through (i) reduced importation of fossil fuels, (ii) lower cost of power generation placing downward pressure on power tariffs thereby supporting private sector and reducing household expenditure, (iii) improved energy security, and (iv) reduced tariff volatility due to partial conversion of the national grid to renewable energy.* There should be some caution in statements about future electricity tariffs as small generation networks often have relatively high fixed costs (admin, lines, distribution) – levels of 40% - 50% of current costs are not unusual. This means that while the diesel fuel dependence can be reduced (offering clear economic benefits) the final net cost of generation may fall less than anticipated. It would be valuable (if not already available) for data to be prepared that clearly shows the fixed / variable cost structure under current generation arrangements; this can then be used to construct a more realistic projection of future tariffs with alternative RE sources, managing expectations amongst customers	Agreed. During project design analysis will be undertaken to assess impact on tariff. Expectations for tariff reductions will need to be managed. A tariff review is proposed to be undertaken by SIEA in 2014 which will assess cost of service and tariff levels under a range of system expansion plans including grid connected solar.
6.	Financing Plan. It is noted that there will need to be a number of additional funding resources to ensure that the overall programmes as outlined can be accomplished. It is assumed that the confirmation of these resources will be a prerequisite of the release of SREP funds?	Project design will match available funding. The current financing plan is presented in Section 6. SREP will be advised should there be any changes to the financing plan.
7.	Financing Plan. There are no specific comments on the costs as indicated other than to note that Project Preparation costs are relatively high at $1m and that these are shown as identical for both projects. Is this reasonable?	The project preparation costs will include full ADB/WB due diligence. The proposed amount is considered reasonable and usual for similar project preparation.
8.	Compliance with SREP. Catalyse increased investments in renewable energy. The plan outlines how it is anticipated that SREP investments and programme support will help attract other public and private funding. The engagement with the private sector is only covered briefly. What is clear is that SIEA and MMERE are expected to provide the leadership during implementation. While there is an outline of the governance of the SREP programme it is noted that there is no private sector participation in the project steering committee.	Private sector participation on the project steering committee has been included in Section 8.
9.	Compliance with SREP. Enabling Environment. The plan acknowledges that there are a number of unaddressed hurdles to renewable implementation; there are strategies and an allocation of responsibilities to particular agencies to address these. Without prior engagement with these agencies it is hard to assess whether these tasks can reasonably achieved by these entities. This process will require close monitoring as the success in establishing a sound enabling environment will be a key control on the value of the SREP investments.	Noted. This will be monitored closely during project design.
10.	Compliance with SREP. Implementation Capacity. The roles of SIEA and MMERE in the implementation of the programme are spelt out in detail. However as noted earlier, it is difficult to get an independent assessment of how realistic these expectations on	Noted. The SIEA Board will approve project design of the proposed SIEA implemented components. Component design

	their respective capacities are. It is suggested that SIEA has had improved performance since it was set up as an SOE; it is important to note however that the proposed programmes under the SREP support will require SIEA to work in an increasingly different operating environment from that of running a centralised diesel generation system. This will require the strong support and commitment from the board of SIEA to ensure the SREP work is executed effectively.	will include capacity building strategies to ensure sustainable operation.
11.	The question of land ownership appears to be central to many of the proposed project components. It is acknowledged that this is not easily resolved but the seriousness of the impacts that it can have on delaying project implementation- whether generation or reticulation – are clear. It is suggested that, provided it does not complicate current considerations, that some consideration be given to providing opportunities for equity participation by land owners in generation facility developments.	The option for landowner equity ownership will be assessed on a case-by-case basis during project design.

Independent Quality Review

1.0 Introduction

1. The review of the Investment Plan for the Solomon Islands has been undertaken ahead of the submission of the plan to the SREP Sub-Committee of the Strategic Climate Funds, within the Climate Investment Funds at the World Bank.

2. These notes are based on a review of the draft plan of October 2013, provided in late March 2014. It should be noted that the reviewer has not visited the Solomon Islands nor been involved in the preparation of this plan. The lack of a visit to the Solomon Islands and direct contact with the ministries, agencies, institutions and various stakeholders has an impact on some of the interpretations that have been drawn in this review; the reviewer has not been involved with energy opportunities, other than an indirect involvement with the current Savo Island geothermal investigations, so has limited familiarity with the wider energy situation in the region.

3. The overall impression of the Investment Plan is that is thorough, has considered the key issues that will impact the uptake of renewables and that the opportunities for support through the SREP facility have been carefully considered and reviewed.

4. As with all such programmes, it is a challenge to determine in advance how implementation will proceed. It is understood that there has been limited experience with renewables, other than with hydro, in the Solomon Islands and as such there are of number of issues that may influence the proposed activities.

5. One issue that is clearly highlighted as a potential impediment is that of land ownership. While it is outside the scope of this review, we have considerable experience in New Zealand with the development of our geothermal resources in particular where the Maori land owners are equity participants in the projects. This has been a very effective arrangement as it provides for some risk sharing on projects – if the progress is facilitated by all parties there are some real mutual benefits. The earlier approach in New Zealand was one of land acquisition by government and this was never seen to provide the most equitable outcome for all involved.

2.0 Specific Comments on Investment Plan

2.1 Country Energy Policy

6. It is noted in the IP that: "*The National Energy Policy Framework, 2007 sets out the broad policy directions, and has two over-arching goals; (i) promote the optimal use of renewable energy (RE) technologies, and (ii) minimise negative impacts on the environment from the production, distribution and consumption of energy. It provides a basis for developing specific actions in pursuit of these principles and encourages the sector participants to adopt appropriate, indigenous cost-effective RE technologies to meet*

energy demand in the country. The National Energy Policy Framework was revised in 2013[16] *and a draft is currently before Cabinet for review. The draft National Energy Policy includes a RE target of 50% by 2020 (installed capacity) and aims to*:

- *set development priorities and standards;*
- *define directions for the development of laws, regulations and procedures for guiding orderly and optimal implementation and management of renewable energy projects;*
- *set objectives in developing institutional capacities of Government agencies charged with the promotion of renewable energy projects;*
- *establish a financing framework that provides appropriate security and incentives to encourage sustainable development of renewable energy projects.*

7. Such a policy is perhaps typical of many of the island states internationally, and has particular relevance to those within the Pacific. With a relatively small generation base serving less than 12% of the population through grid interconnections and a total dependence for this supply on imported fossil fuels, this again reflects the challenges most island nations are facing.

8. The IP recognises that to address the current situation there is a need for both policy and regulatory support and a focus on realistic near term projects that can build experience and demonstrate the effectiveness of renewables within the current generation mix. The IP outlines that there are two projects proposed for SREP support:

Based on the country and sector contexts, and SREP criteria[17], the Government in consultation with stakeholders including organisations from the private sector and civil society, have identified 5 priority investment components, which will be executed via 2 projects. The following projects comprising these 5 components are proposed for SREP co-financing:

- *Project 1: Renewable Energy Access (World Bank)*
  - *Component 1 – Renewable Energy Mini-grids;*
  - *Component 2 – Grid Extensions;*
  - *Component 3 – Renewable Energy Enabling Environment;*
- *Project 2: Solar Power Development (Asian Development Bank)*
  - *Component 4 – Grid-connected Solar Power;*
  - *Component 5 – Upscaling Household Solar Power.*

2.1 Component 1: Renewable Energy Mini-Grids

9. It is understood that the intent is to install some 60 mini-grids in essentially rural locations where any existing power – available to less than 5% of the rural population - is through a small number of individual solar home systems and off-grid diesel plants. These mini-grids will use hydro, bio-diesel and solar energy. There is growing experience with mini-grids but they do require effective administrative design and management.

Comment: It is noted that there is very limited experience with bio-fuels to date; while the opportunity for coconut-oil based biofuels is being considered it is perhaps important that this be reviewed in the light of experience elsewhere. While the concept of using coconut oil has been considered fairly widely in the Pacific, despite there being large numbers of coconut plantations, these are often old and have not been replanted; oil production has not been easy to establish and maintain. Anecdotal reports from Vanuatu for example suggest that UNELCO set up its own supply and production facility after failing to get adequate sustainable supplies of oil from external contractors.

[16] Draft Solomon Islands National Energy Policy, 2013-2023, Ministry of Mines, Energy and Rural Electrification.

[17] www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/SREP_Criteria_for_Selecting_Country_and_Regional_Pilots_under_SREP_final.pdf , March 26 2010,

2.2 Component 2: Grid Extensions

10. It is outlined that with the potential construction of the Tina River Hydro (Honiara) (predicted to go to bid in the second quarter of 2014[18]) and the Fiu River Hydro scheme (Auki) there will be a significant RE component of generation and that this will allow expanded grid interconnections as demand grows with tariff reductions.

2.2.1 Grid Extension Design

11. In extending the grid a number of points are noted in the IP (5.3.3.).

The output of Component 2 will consist of connecting an estimated 1,400 households. Component 2 will include hardware and installation costs of connecting households to the low voltage grid, prepayment meter and basic household wiring. Note that the extension of the distribution grid will be financed by SIEA and the main internal household wiring will be financed by the residential customer.

Question: Has this been the past practice that customers finance internal wiring? Are there any issues of affordability?

12. The grid connection offered will be the minimum technical feasible solution and as such targeted at entry level customers, i.e. the capacity of the connection offered will be insufficient to supply commercial or industrial customers or residential customers that have large loads.

Question: Is this the most appropriate approach, to utilise a *minimum technically feasible solution*? What is the real cost differential between this and a more robust solution that will set high standards from the outset and will avoid the risk that customers may attempt to draw higher loads through poorly specified connections? Should the system be designed with future demand growth in mind? Safety should be a key consideration.

2.3 Component 3: Renewable Energy Enabling Environment

13. The IP highlights the fact that:

There are a number of barriers identified to the expansion of renewable energy in the Solomon Islands. These include (i) lack of standardized and streamlined approaches for land acquisition for distribution extensions and mini-grids, (ii) outdated regulatory framework which requires revision, (iii) requirement to improve system planning and project management capacity within SIEA, and (iv) need to strengthen MMERE capacity to develop appropriate policies and regulations.

14. Again this is experience is reflected across a number of similar situations in the Pacific. The approaches suggested appear reasonable but the efforts required to get agreement amongst all stakeholders should not be underestimated.

15. In the early notes a brief comment was made about land ownership and acquisition. This is an issue that in many jurisdictions has been ignored to date and is now becoming a significant hurdle for energy developments.

Comment: While landowner participation in projects may not be an appropriate local solution in all situations, it is suggested that it be considered. Income from the one-off sale of land or through royalties can seem appealing to both sides as a project is being conceived. However experience has shown that where there can be a modest level of equity participation by land owners there are a number of benefits that take into account ancestral and cultural consideration; see all parties bearing some of the underlying development risks (eg the avoidance of extended project timetables where land ownership becomes the most important stumbling block) and ensures that all parties have a share in the ongoing income from the project. The goals of all parties are aligned, rather then there being a growing separation of interests where landowners can feel increasingly disenfranchised as they observe others benefitting from a commercially successful venture in which they have no participation.

[18] http://tina-hydro.com/The%20Tina%20River%20Hydropower%20Development%20Project

2.3.1 Revised laws and regulations and capacity building

16. There is no question that improvement in the policy and regulatory environment and the strengthening of SIEA and MMERE are critical components of future energy development in the Solomon Islands and essential if renewables are to be increased and there is to be engagement with private sector investors and developers. It is suggested that efforts be made to keep the regulations straightforward; clear and consistent regulation is crucial to attracting and maintaining the interest of private investors. Learning from the approaches (and mistakes) of others in the region (and in similar settings internationally) is invaluable. There are many instances where it is not the challenge of technical solutions that have thwarted apparently excellent development opportunities; rather it is the lack of a robust and reliable regulatory environment.

2.4 Component 4: Grid-connected Solar Power

17. The considerations and proposals for the development of grid-connected solar power appear compelling. There is growing experience with similar installations in the Pacific.

18. One key learning is that, given the often small scale of existing generation, it is essential ahead of confirmation of the capacity of solar installations that a grid integration – and grid stability – study be completed. From the outset the utility must be a part of discussions as there are a number of examples where overly optimistic plans for solar have not been compatible with the existing grid and current diesel generation facilities. The IP notes a grid integration analysis but it is shown as step (iii) when it should potentially be the first consideration.

Comment: It is noted in the IP that:

Increased solar generation will benefit the economy through (i) reduced importation of fossil fuels, (ii) lower cost of power generation placing downward pressure on power tariffs thereby supporting private sector and reducing household expenditure, (iii) improved energy security, and (iv) reduced tariff volatility due to partial conversion of the national grid to renewable energy.

There should be some caution in statements about future electricity tariffs as small generation networks often have relatively high fixed costs (admin, lines, distribution) – levels of 40% - 50% of current costs are not unusual. This means that while the diesel fuel dependence can be reduced (offering clear economic benefits) the final net cost of generation may fall less than anticipated. It would be valuable (if not already available) for data to be prepared that clearly shows the fixed / variable cost structure under current generation arrangements; this can then be used to construct a more realistic projection of future tariffs with alternative RE sources, managing expectations amongst customers.

2.5 Component 5: Up-scaling Household Solar Power

19. The approach to introduce a commercially based model for solar home system installations is welcomed. Again there is considerable international experience with such models and the experience from these has demonstrated that they can offer an appropriate return to private sector interests. The approach outlined in the IP appears to address the key considerations around equipment specification and standards, installation, ownership, and ongoing servicing, all of which have undermined less well considered projects.

20.

3.0 Financing Plan

21. It is noted that there will need to be a number of additional funding resources to ensure that the overall programmes as outlined can be accomplished. It is assumed that the confirmation of these resources will be a prerequisite of the release of SREP funds?

22. There are no specific comments on the costs as indicated other than to note that Project Preparation costs are relatively high at $1m and that these are shown as identical for both projects. Is this reasonable?

4.0 Compliance with SREP

23. Key focuses within the SREP programme can be summarised under the following headings; the response of the Plan to each of these aspects is noted in the following comments.

Catalyse increased investments in renewable energy:

24. The plan outlines how it is anticipated that SREP investments and programme support will help attract other public and private funding. The engagement with the private sector is only covered briefly. What is clear is that SIEA and MMERE are expected to provide the leadership during implementation. While there is an outline of the governance of the SREP programme it is noted that there is no private sector participation in the project steering committee.

Enabling environment

25. The plan acknowledges that there are a number of unaddressed hurdles to renewable implementation; there are strategies and an allocation of responsibilities to particular agencies to address these. Without prior engagement with these agencies it is hard to assess whether these tasks can reasonably achieved by these entities. This process will require close monitoring as the success in establishing a sound enabling environment will be a key control on the value of the SREP investments.

Increase energy access:

26. Access to electricity in the Solomon Islands is limited to less than 20% of the population. The focus of SREP supported activities is the development of reliable, cost effective and secure models of supply of national energy going forward. In itself the SREP programme will not have a major influence in correcting the lack of energy access but it will help establish more robust approaches for future electrification.

Implementation capacity:

27. The roles of SIEA and MMERE in the implementation of the programme are spelt out in detail. However as noted earlier, it is difficult to get an independent assessment of how realistic these expectations on their respective capacities are. It is suggested that SIEA has had improved performance since it was set up as an SOE; it is important to note however that the proposed programmes under the SREP support will require SIEA to work in an increasingly different operating environment from that of running a centralised diesel generation system. This will require the strong support and commitment from the board of SIEA to ensure the SREP work is executed effectively.

Improve the long-term economic viability of the renewable energy sector:

28. The renewable energy sector in the Solomon Islands appears to be at a relatively early stage. The SREP funded activities are therefore more focused on establishing a strong and sustainable basis for future growth; there will be limited private sector engagement at this stage but the legal and regulatory changes and enhancement of the enabling environment should help ensure future growth in the sector.

Transformative impact:

29. The targeted nature of the proposed SREP investments in the Solomon Islands is seen as pragmatic given the current domination of diesel generation, limited electricity access and a need to enhance the enabling environment. Given the renewable sector is relatively immature it is not to be expected that there will be major transformations in the market through SREP alone but if well managed and executed the proposed programme should help develop the renewable energy sector in the country.

5.0 Comments and Recommendations

30. The Investment Plan as presented is well considered; it reflects what appear to be realistic targets with a balance of execution of components between SIEA and MMERE.

31. The plans are moderately aggressive and the target of 50% renewables by 2020 is clearly dependent on the successful commissioning of the Tina and Fiu River hydro projects. These projects have been under consideration for an extended period and their timely implementation is critical.

32. The question of land ownership appears to be central to many of the proposed project components. It is acknowledged that this is not easily resolved but the seriousness of the impacts that it can have on delaying project implementation- whether generation or reticulation – are clear. It is suggested that, provided it does not complicate current considerations, that some consideration be given to providing opportunities for equity participation by land owners in generation facility developments.

33. The oversight of the SREP programme may benefit from the inclusion of private sector representatives on the Steering Committee. Engaging the private sector at this level may bring longer term benefits as they become more actively involved in the renewable energy sector.

34. This report and these recommendations have not been discussed with those who prepared the Plan, and so should be treated as interim comments; it is hoped that a discussion can be arranged in due course.